HYGEIA. Adapted from a Wall Painting at Pompeii.

A FIRST READER

IN

HEALTH & TEMPERANCE.

BY

W. TAYLOR

Late Head Master of Sir Walter St. John's School and Master of Method, Battersea Training College.

TWENTY-FIRST THOUSAND.

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NOTICES.

SIR WM. BROADBENT, K.C.V.O., &c., writes: "I have gone over the 'First Reader in Health and Temperance' which you have been so kind as to send. It contains the lessons we as medical men desired to inculcate, and a good deal of simple physiology."

"This little book is intended to teach the young how they grow, how they get sick, and how they may keep their bodies healthy and strong. . . . The text is bright and easy of comprehension, and the subject-matter is well arranged. The book is nicely illustrated, and any boy or girl who uses the Reader will derive both pleasure and useful knowledge. The tone of the little book is exceedingly good and it should prove a useful gift to children.—*The Lancet.*

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"THE author of this book is evidently a skilled teacher, and he is to be congratulated on the success with which he has worked up the commonplaces of physiology into a narrative which will undoubtedly interest children. His attitude towards the alcohol and tobacco questions is decided but temperate."—*School World.*

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HEALTH & TEMPERANCE.

Lesson I.—The House We Live In.

(1.) YOU are beginning a new Reading Book, and you will want to know what it is about. It will tell you nothing about things which happened long ago, and little about the strange places, people, and things found in foreign lands. It will tell you nothing about your own country, nor about the good and great people who have lived in it. It is all about your own bodies. It will teach you how they grow; how they get sick; and how you may keep them healthy and strong.

(2.) Every person born into this world has one house of his own: he will live in it as long as life lasts; he will only leave it at death. He did not buy it, neither does he pay rent for it: it was God's gift to him when he was born. Do you know what house I am speaking about? It is the living, growing, moving house which you call *your body*. The Creator made it and gave it to you to hold that wonderful part of you which you call your *soul*.

(3.) There is much that is wonderful in the dwelling-house where you live. The bricks were made of clay burnt in a brick kiln; the stone came out of a quarry; the slates came from the sides of a great mountain in North Wales or Cumberland; the timber came from great forests in Canada or Norway. The mason, the bricklayer, the slater, the carpenter, the painter, and many other workmen helped to build it and make it fit for a dwelling-place. But our own houses, *our bodies*, are far more wonderful and curious than even a king's palace. In this first lesson you will learn some of the wonders of your own bodies.

(4.) Your bodies are *living*, *growing*, *moving*, and *feeling* bodies. A dwelling-house of stone or brick neither grows nor moves; it always remains the same, unless the builder adds new rooms to it, or alters it in any way. It cannot grow of *itself*, as our bodies grow; neither can it move from its place. Fire may burn it down, but it feels nothing. Our bodies feel the winter's cold and the summer's heat, and they are always doing something. The parts of your dwelling-house can do nothing of themselves. The door cannot shut itself, nor the window open itself. But every part of your body is *active*—that is, it has some work to do for itself and for the rest of the body. The legs learn to walk, run, and jump. The hand learns to do many useful and clever things. The eye sees; the ear hears; the mouth speaks and eats. Some parts of the body are always doing their useful work; even when we

are asleep our *lungs* go on breathing and our *heart* continues to beat.

(5.) Because the body is always doing work it is always *wasting*. Just as every letter you write with a pencil wastes away the point of the pencil, so every movement of the body causes some part of it to waste away. When your dwelling-house needs repairs, when the wind blows a slate from the roof, or when the paint on the woodwork decays, the proper workman comes to make good what has perished. But how are our bodies repaired? How is what is wasted replaced? And when any part gets hurt, how is it healed? If by chance you lose a finger-nail, another soon comes in its place; if you should fall and break a bone in the arm, the broken pieces will grow together again after the doctor has fastened them in their proper place. Our wonderful bodies can do their own repairs neatly and quickly; and as fast as skin, flesh, and bone waste away, new skin, flesh and bone take their places.

(6.) Dwelling-houses differ very much in size and shape and convenience. Some are built of wood; others of bricks or stone; others of costly marble. But our bodily houses are all of the same shape and materials, and nearly of the same size, for God has made them all after one pattern. We may differ a little in size and features, just as we differ in strength and quickness; but there is no real difference between the way in which our bodies are formed.

(7.) When every part of the body can easily do

its own proper work, without pain or discomfort, we say the body is *healthy*. "Health" is a good, old Saxon word. It comes from the word *heal*, which means *to make whole*. Our Lord said to the poor infirm man who was waiting for health at the side of the pool in Jerusalem, "*Wilt thou be made whole?*" When every part of the body is working well, then the body is *whole*, that is, in perfect health. It feels no pain; every part feels at ease. But when the body gets out of order, instead of ease we have *disease*. Disease means absence of ease; pain and discomfort taking the place of ease. The body gets feeble when disease comes. We no longer care for food, nor even play. Many to whom God has given strong, healthy bodies do not take care of them, and then they lose health. There are many ways in which you can hurt and even destroy good health, as these lessons will teach you. Too many people wickedly and carelessly throw away good health. Health has its rules just as a school has its rules. If you want to be healthy and strong you must learn the health rules and keep them.

(8.) We have said nothing about the *tenant*, the dweller in our living house. It is *the living soul* which thinks, remembers, loves, and fears. The soul is far more important than the body, just as the people who live in a house are of more importance than the house. Our bodies will die; but we believe the soul will not die. We must strive to keep our bodies clean, pure, temperate and strong, because they are the dwelling places of the soul.

SUMMARY OF THE LESSON.

Our bodies are the houses in which the soul lives. They are full of wonders, for they are God's workmanship. They are houses which *live and grow*, *move and feel*. Every part of the body has its work to do, and as it works it wastes. The healthy body can make good this waste. When every part of the body is doing its proper work easily and perfectly, we say it is healthy.

Lesson II.—More About the House We Live In.

CANADIAN LOG HUT.

(1.) HOUSES are built in many ways, according to their size, the materials used, and the purposes for which they are raised. The wandering tribes of Red Indians live in tents, because they have no settled homes. A tent, as you know, is a simple, moveable house of one storey. It is supported by

a framework of poles and ropes, and is covered with cloth or skins. Settlers in the newly peopled parts of Canada generally begin by building a small hut, covered in and kept warm with sods

INDIANS AND THEIR TENTS.

of turf. Next they build a small wooden house of one storey. They raise a house of strong logs, and plaster the spaces between the logs with mud. As they get on, they usually build a better house,

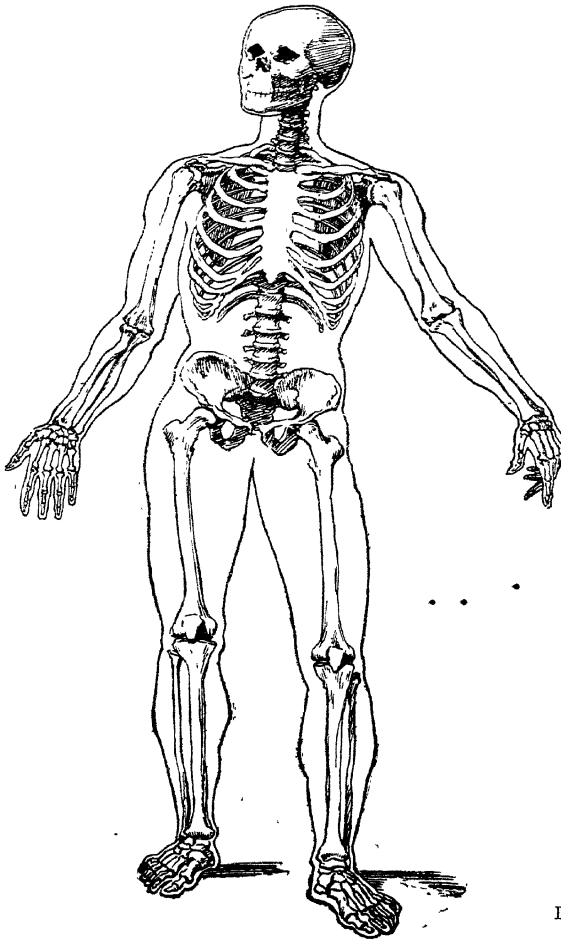
with a framework of timbers, covered inside and outside with thin planks, and roofed with *shingles* —that is, small wooden tiles of cedar, overlapping one another, as slates do on our roofs.

(2.) Our bodies are made with a framework consisting of many strong bones. Their walls are soft, living flesh, and if they were not supported by the bony frame-work they would have little strength or sta-bil-i-ty. The walls of flesh are covered with the soft, strong, and tender skin, which makes our bodies look so comely. The human house, the body, is more like a tent in the way it is built than like a house of brick or stone. There are other things in which it is very like a tent. It is not a fixed, but a moveable house, and when its work is done, and life ends, it is like a worn-out tent, whose parts are folded up and laid aside.

(3.) When we want to understand how a building with a framework is constructed, it is best to begin by studying the frame-work. On page 9 is a sketch, which shows only the outlines of the body with the frame-work of bones within. You see *the head*, placed like a watch-tower or turret on the top of the house. You see *the limbs*, the arms and legs; and you see what is called *the trunk*, to which the limbs are fastened. Now, let us look only at the bony frame-work. Notice the long, strong bones of the legs, which act as *pillars* to support the trunk and the upper parts of the body. If you look carefully, you will notice *an arch of great bones* resting on the two bony pillars which form the legs. See how beautifully the thigh bones

fit into the under sides of this useful arch; and how its upper sides form a hollow basin, which carries the lower parts of the trunk. Resting on *the crown, or top of the arch*, you can see another pillar, called *the spine* or *back-bone*. It is *the chief pillar or main-prop* of our bodily tent. It supports *the head;* and *the ribs*, the strangely twisted bones forming a kind of cage, are all fastened to this main prop. The shoulder bones and the bones of the arms rest upon the bony cage made by the ribs. So you see that all the parts of the body are joined to, and supported by, the great bony arch and the central column which rests upon it.

(4.) Is our wonderful house a house of one storey or of several storeys? I think we may best speak of it as a house of three storeys, standing upon two pillars. In dwelling-houses, as you know, the lower storeys are generally better furnished, and considered of more importance than those at the top of the house. But certainly it is not so in our bodily house. The top storey is *the head*, or watch-tower. The second storey is *the chest*, which forms the upper part of the trunk. And the lowest storey is *the ab-do-men*, the lower part of the trunk. We must certainly give to the top storey, or head, the place of chief importance. In it are the windows--*the eyes*, through which the mind looks out and sees the world. The head also contains *ear-gate*, without which not one spoken word, not one strain of music, nor song of bird, could reach the soul within. *Nose-gate* and *taste-gate* are both in the head; and there also is the *tongue*, by which we



so readily tell our thoughts and wishes to others. But while the upper storey is most important, and deserves its high place of honour, we must remember that the lower storeys are important too. The chest contains *the lungs*, with which we breathe, and *the heart*, which continually pumps the warm blood through our bodies. The abdomen contains *the stomach* and the other organs by which food is digested, that is, prepared to pass into the blood. The mind's work—seeing and hearing, thinking and speaking, learning and remembering—is done in the head. But every bodily organ has its own proper work, which it must attend to, or the whole body must suffer.

(5.) There is a famous palace in Rome, the capital of Italy, which is said to contain eleven thousand rooms, court yards, and passages. Would it not take a life time to learn to know well this wonderful palace, and the many treasures which it contains? Our bodies are far more wonderful than that noted Roman palace. They are full of rooms, and corners, and tiny passages. Learned men who have spent their lives in studying the body have not nearly mastered all its wonders. But you can easily learn enough about it to say with the Psalmist, "*I am fearfully and wonderfully made*," and enough to teach you how to take proper care of your bodies so that they may grow up healthy and strong.

sta-bil-i-ty : strength to stand firmly without overturning.

or-gan : any part of the body which has some special work to do. The eye is the *organ of sight*.

SUMMARY OF THE LESSON.

The body is made up of the head, trunk, and limbs. It has a strong frame-work of bones; its walls are of flesh; and it has an outside covering of skin. The two legs are pillars which support a strong, bony arch. The spine, or back-bone, stands on the crown, or top, of this arch, and carries the head, the ribs, and the arms. The upper sides of the bony arch are hollow, like a basin, and support the lower part of the trunk. The three storeys of the wonderful house are the abdomen, or lower trunk; the chest, or upper trunk; and the head, or watch-tower.

Lesson III.—Health, and How to Keep It.

(1.) JAMES PRICE, our village blacksmith, has two boys, aged eleven and thirteen years. The elder boy, Richard, was a strong little fellow until he was about seven. He was then knocked down by a horse and badly hurt. The spine, the great bone which runs up the middle of the back, was injured, and he will never be strong and well any more. At times he suffers much pain and is obliged to keep his bed. He has learned to be very patient under suffering; but he is very thankful when the pain goes away for a time. Then his kind mother props him up in an easy chair near the window, so that he may see the boys at play upon the green. How pale he looks! and how thin and pinched his face is! He has not known what good health is since he met with the accident which made him an invalid.

(2.) Harry, his younger brother, is full of health and good spirits. His limbs are straight and

strong ; he is fond of all active games, such as cricket, hockey, and swimming. He comes home with a good appetite for his food. But before he begins to eat he is always ready and willing to

help his mother to wait upon Dick. The poor sick boy is very dearly loved both by parents and children, and the best portions of food are always set aside for him, to see if they can tempt his

small appetite. Harry never forgets to bring his sick brother the first sweet flowers in spring-time, and the first ripe berries in autumn. When Dick is too weak to sit up and hold a book, Harry is always willing to read to him, or to tell him what has happened in school or on the green.

(3.) Harry is a thoughtful boy for his age, and the daily sight of his sick brother has made him thankful his own health is good. His father tells him that good health is one of God's best blessings; that it is far better than riches; and that there are two things every child who has health ought to do. The first thing is to thank God for it, and the second is to learn how to take care of it as a treasure worth keeping.

(4.) What is health? And what is disease? If we look at Harry as he races with a school-fellow over the green; if we watch how ready he is for his meals, and how largely his mother helps him to food; if we could stand by his bedside and see him sleeping soundly and quietly through the night, we might say "Harry is full of health: he will make a strong and healthy man." And if we want to know what sickness means we need only go now and then to Dick's room and notice his weakness, his pain, his want of appetite, and his want of spirits.

(5.) But what is health? You learned the answer to this question in Lesson I. Perhaps the best answer we can give is that of a great and good doctor, who said: "*Health is that state of the body in which living is felt to be a pleasure.*" How

pleasant it is for Harry Price to play, to run, to talk, to eat, to sleep! What a picture of health he looks as he runs indoors when school is over, with his quick step, his rosy, plump cheeks, and his

hearty laugh! But living brings very little pleasure to Dick. His lot is to feel weak and to suffer pain. His cheeks are pale and thin, his limbs are puny, and he looks sad and weary.

(6.) But why should there be any sickness or pain? You must not think that pain and sickness are altogether bad things. They are useful, warning voices to tell us that something is wrong with the body. Very often we should not know there is anything the matter with us if it were not for pain. When it comes we must try to bear it patiently, as Dick Price did. He lost his good health, as many others have done, through an accident. Many lose health by diseases which we can take from one another. Many others get ill in the cold winter months because they have not sufficient good food, warm clothing, and proper shelter. Be very thankful if you do not know what it is to be hungry, cold, and homeless. But there are other ways in which people lose good health. There are many who destroy their health by breaking the laws of health. A law is a rule which we cannot break without having to suffer for it. If we break the rules of the school we must expect disgrace and punishment. And all who break the laws or rules of their bodies will, sooner or later, suffer loss of health.

(7.) A boy may break a rule through ignorance—that is, because he does not know it; or he may break it because he is careless and forgets it when he ought to remember it. And he may break it wilfully—that is, on purpose. But whichever way we break the rules of the body, we shall suffer for it. This is why it is important for you to learn them while you are young: then you need not injure your health through ignorance. Do you know what *a habit* is? When you have done a thing so often

that it becomes very easy to do it, we say you have formed the habit of doing it. If you fall into bad habits while you are young you will find it hard to change them. There are bad habits which do harm to the body. The habits of eating and drinking more than the body needs, and of eating too fast; the habit of laziness which makes you idle both for work and for play; all dirty habits which prevent you keeping the body and the clothes perfectly clean; all these bad habits do much to make the body sickly and weak. We must not forget one of the most hurtful of the bad habits which young people can fall into. It is that of cigarette smoking. No one who forms this bad habit must expect to grow up as healthy and strong as he ought to be. As you get further into this book, you will learn how and why, these and other bad habits, are hurtful to health.

in-va-lid, a person who is weak and ill.

pu-ny, small and feeble.

ac-ci-dent, something that happens suddenly and by chance.

SUMMARY OF THE LESSON.

"Health is that state of the body in which living is a pleasure to us." Pain is not a bad thing in itself, because it tells us when anything is wrong with the body. Sickness may come in several ways. It may be caused by accident. We may take some diseases from those who have them. Disease may be caused by want of food, clothing and shelter. We may, through ignorance, carelessness, or wilfulness, fall into bad habits, and thus break the laws of health.

Lesson IV.—Some Things the Body Needs.

(1.) THERE are some things which, when they are once lost, can never be regained. The person who is so unfortunate as to lose an eye or a finger cannot have the lost member replaced. Other things may be lost for a time and then found again, and often health is one of these things. But it is much better to keep healthy, than to get sick and have to call in the doctor. In the last lesson you learned that there is much sickness which might be prevented if people only knew and obeyed the laws of the body. The laws of the land tell us what things the King and Country require of us. And the laws of the body tell us what things the body needs in order to keep it strong and well.

(2.) Our bodies need many things; and the body itself tells us plainly that it needs them. *Hunger* is the voice of the body saying it wants *food; thirst* tells us it needs *drink; weariness* says it needs *rest.* We may refuse for a short time to listen to these voices, but soon they become so loud that we are obliged to attend to them. Let us listen to the body as it tells us some of its needs.

(3.) *The stomach* speaks first, and says: "I must have food and drink. Without these things not only should I be very uneasy, but the whole body would get weaker and thinner, and in a few days it

would die. I want good, wholesome, well-cooked food every day; and if I have enough pure water—the first and best drink which man ever drank—I need no other beverage."

(4.) *The lungs* next speak and reply to the stomach. "The stomach says that if it were kept from food for a few days the body could not live. Our needs are more urgent still. We need plenty of fresh, pure air, and unless we get it, the body cannot remain healthy and strong, even if the stomach has all it requires. We must draw in air from fifteen to twenty times a minute and if by any accident we could not go on breathing, life would end. Are not our wants even more pressing than those of the stomach?"

(5.) Next *the skin*, which covers the whole body, makes itself heard. "The stomach and the lungs have wants which must be satisfied; but they are not wants which we can well forget. I have important wants which are more likely to be neglected than those of either stomach or lungs. I am full of tiny holes, or pores, through which the sweat is always passing outwards. Through these pores comes out a good deal of waste material, which would do harm if left in the body. This is the reason why I ought to be kept perfectly clean. My pores are some of the drains of the bodily house; and if we do not keep the drains cleansed the house cannot be healthy. People wash the face and neck daily; but this is not enough. The whole body needs daily cleansing. If I am to be kept quite clean, I ought to have a cold bath every day and

a warm bath once a week. And I need clothing as well as cleanliness. The Creator has supplied birds and beasts with beautiful coverings of feathers, wool, hair, and skin. But I need clothing to shelter me from the weather, to shield me from hurt, and to help to keep me clean."

(6.) After the stomach, the lungs and the skin have spoken, the whole body begins to speak, and says: "All that has just been spoken is quite true. I cannot be an active, strong, healthy body without enough wholesome food and drink, plenty of fresh air, warm, clean clothing, and perfect cleanliness. But there are other wants besides these. I want *exercise*, especially in the open air. Boys and girls get plenty of bodily exercise in their games. Men who earn their living by bodily work get plenty of exercise. Those who earn it with their brains, as the clerk and the teacher, the lawyer and the doctor, need active out-of-door exercise. I cannot continue to be a strong, healthy body unless my muscles have regular work to do."

(7.) "Though I am fond of exercise I soon get tired. *Rest* is as needful to me as work. The most useful rest is sound sleep. When I lay myself down and fall asleep, the tired muscles soon recover; the weary brain forgets its thoughts; and every part of me which needs rest, finds it during these quiet, silent hours."

(8.) The body has told us it needs wholesome food and drink, fresh air, cleanliness, clothing, exercise, and sleep. Yet we must not give nearly all our attention and care to the body and its wants.

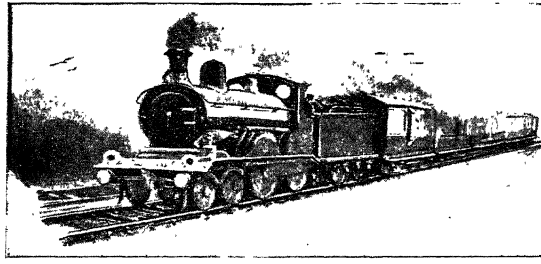
The body is only *a house;* the soul is its *inhabitant.* Which is the more important—the house or its inhabitant? God meant the soul to be master over the body, and to keep the body in temperance. Temperance tells the greedy body to stop eating when the stomach is satisfied. It tells the lazy body to get up and work when it is well rested. Temperance means governing all our bodily appetites—holding them firmly under control, so that the soul is master over the body. As these lessons proceed, you will learn that we cannot have and keep healthy bodies unless we are "*temperate in all things.*"

mem-ber: a part of the body; an organ.
bev-er-age: anything used as a drink.
ur-gent: wanting immediate attention; pressing.
con-trol: power to check or hinder.

SUMMARY OF THE LESSON.

If we break the laws of health we cannot keep healthy and strong. One of these laws tells us that the wants of the body must be regularly supplied. The body needs wholesome food and drink, abundant fresh air, perfect cleanliness, warm, clean clothing, regular exercise, and regular rest in sleep. Bodily appetites must be kept under control. This is another law of the body—the important law of *temperance in all things.*

Lesson V.—Food: and Why We Need It.

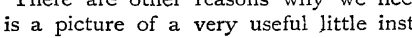


(1.) IN the first lesson you learned that our bodies are living and growing bodies. Things which are living and growing are always changing. Look at a baby, with its small limbs and its tiny, feeble fingers. How wonderful it is that in a few years the baby boy will, if his life is spared, be probably a tall and strong man! But *how* do living things grow? How did the large oak tree on the village green get such a thick trunk and long, twisted branches? A hundred years ago an acorn was, by chance, dropped in the ground, and it began to grow. The tiny plant which grew from the acorn sent a little root downwards and two little leaves upwards. Its roots were full of small mouths, which sucked from the ground the food the plant needed. The air and sunlight around the leaves also helped it to grow. Day by day for a hundred years it has

gone on growing, with the help of the nourishment it obtained through its roots, and of the fresh air which it breathed in through its leaves. Our wonderful bodies grow in much the same way. The food and drink we take into them through our mouths, and the fresh air we draw into our lungs, make them grow. There can be no growth without food of some kind.

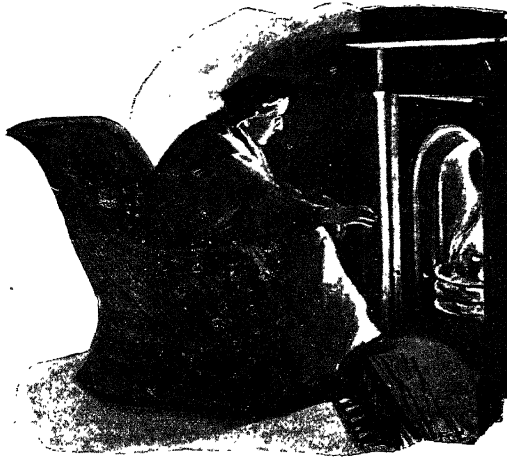
(2.) You also learned in the first lesson that our bodies are always *wasting;* that we cannot speak a word, or raise a finger, or do anything without some portion of the body wearing out. When we are young our bodies grow faster than they waste, and so get bigger. When we say we have *stopped growing*, we mean that we are no longer increasing in size. But we are still growing, or the waste would not be made good. In sickness the body often wastes faster than it can grow, and then it gets very thin and feeble. Now you can understand why people who have done growing tall and stout, must still go on eating and drinking. They require food to make up what is lost by the wasting that is always going on.

(3.) There are other reasons why we need food. Here is a picture of a very useful little instrument which the doctor carries with him when he visits



his sick patients. It is called *a ther-mom-e-ter.* When the doctor places it under the tongue, or under the arm-pit of his patient, the warmth of the

body causes the mercury or quicksilver inside the tube, to expand and rise in the tube. When the body is healthy the mercury always rises to the same height, of 98 degrees. If it rises only two or three degrees higher the doctor knows that serious illness may be expected. What seems very strange is that our bodies are at the same temperature during the cold days of winter and the hot days of summer. How is this even temperature kept up ?



(4.) You know that if a piece of red-hot iron be taken out of the fire it soon gets cold—its heat passes into the surrounding air. Our bodies would

get cold in the same way unless they were kept warm by some means. How is your house kept comfortably warm all through the cold winter months? Your parents lay in a stock of *fuel*—that is, coals or wood—and as the fuel burns in the fire-place it gives out the heat which keeps the house warm. When the fuel in the grate is burnt away a fresh supply is put on, or the room would soon become cold. It is the continual burning of fuel which keeps the house warm; *and it is the continual burning of fuel in our bodies which keeps them always warm.* Our bodies are living fire-places, and the fuel which is burnt up in them is the food we eat. This fuel gives out neither smoke nor flames as it burns, but it gives out heat You cannot yet understand *how* this burning goes on; but you can remember that another important use of food is to supply the fuel which burns up in our bodies and keeps them always at the same, even temperature.

(5.) You have now learned three of the important uses of food. You have learned that it supplies the materials which build up the growing body; that it makes good bodily waste; and that it supplies the fuel which burns in the body and thus keeps it warm. There is another use which is, perhaps, still more wonderful. You have seen the locomotive dragging along its heavy line of carriages at great speed. How does it get its mighty strength? All its force comes from the *fuel* which burns in its furnace. It is to the fuel or food which we consume in our bodies that we owe all our bodily force. It is the bread and butter, the meat, pudding,

and potatoes, eaten day by day, which supply us with the strength both for healthful play and for useful work.

in-stru-ment: a tool or machine by which work is done.

tem-per-a-ture: the amount of heat.

ther-mom-e-ter: an instrument for measuring heat.

lo-co-mo-tive: a railway engine.

SUMMARY OF THE LESSON.

Our bodies cannot grow without food. The food we eat supplies the materials which build up the growing body. The body is always wasting, and this waste must be made good or our bodies would soon wear out. It is the food which supplies what is lost by wasting. It also gives the heat which keeps our bodies at an even temperature. Food slowly burns in the body as certainly as fuel burns in a stove or grate. It is food which gives our muscles their strength and enables them to move. We owe our growth, warmth, and bodily force to food.

Lesson VI.—The Kinds of Food the Body Needs.

(1.) ALL the parts of a house are not made of the same materials. The walls may be made of brick or stone, the floors of wood, the roof of slate. It is the same with the bodily house: all its parts are not made alike. The frame-work is of hard bone; the muscles, or fleshy parts which move the body, are made of lean flesh. The skin, nails, and

hair are made of substances different from those which make bone and flesh.

(2.) All these different parts of the body get their materials from the blood. But where does the blood get them from? From the food and drink which we take day by day; from the solid foods, such as bread, meat, cheese, and potatoes; and from the liquid foods like water, milk, and cocoa. Are you surprised that *water* is placed among the foods which the body needs? There is no other thing which the body requires so much of as it does of water. Water forms a large part of pure milk. There is also much water in the solid foods such as bread, potatoes, fruit, and meat. And every part of our bodies, even of the flesh and bones, contains a good deal of water.

(3.) What a large number of articles of food there are for people to choose from! We can put all these articles of food into three classes. First, there is the class of *animal foods*, that is foods which come from animals, birds, or fishes. Milk, (as well as the butter and cheese made from it), and eggs, are animal foods. But by far the largest number of foods come from *vegetables*. The grains, such as wheat, barley, oats, and rye, make the flour and meal from which bread is made. Rice is another important grain; it is said that one-third of the people in the world live chiefly on rice. Think of the many roots, fruits, and leaves of plants which are used as food. Salt is the only *mineral* we eat as food.

(4.) A baby can grow and thrive on one food—*milk*. All the materials which build up the bones

and flesh, the skin, hair, and other parts of its growing body come from the milk. Would you like to know what milk contains? It contains much water. It also contains curds, cream, sugar, and some mineral food such as lime and salt. We know just where each of these foods goes in the baby's body. The curds help to make its flesh; the lime helps to make the bones hard; the sugar and the fat are slowly burned up in the body, and supply the heat which keeps it warm. We call milk a *model*, or *pattern food*, because it contains *all* the different kinds of food we need. Eggs are another model food; so is bread.

(5.) Eggs, milk, and lean meat are good flesh-forming foods; but many grains—such as wheat, barley and oats—also contain flesh-forming food. Some parts of our bodies are made of fat as well as lean flesh, and we must take foods which make fat: sugar, starch, rice, butter, cream, and the fat parts of meat, all help to make the fatty parts in our bodies. These fatty foods also burn slowly in our bodies and supply us with heat; hence we called them *heat-giving foods*. There is much starch in all the grains, and especially in rice. Potatoes also are full of starch, as you may see if you will scrape a slice of potato in water and watch the white starch as it settles.

(6.) There are several other articles of food which do little or nothing to nourish the body; but they give a nice flavour to food and thus they sometimes help those whose appetites are poor. These articles are called *con-di-ments*. Mustard, pepper,

vinegar, horse-radish, pickles, and the spices are condiments. Boys and girls are better without these additions to their food; and some grown-up people should use them very sparingly.

(7.) Our bodies require drink as well as food; and the one drink which the body needs is water. Milk, as you have learned, contains much water, and so does every article of food. The body requires much water for several reasons. Not only the blood, but even the fleshy parts of our bodies contain a great deal of water. Then our bodies are constantly losing water through the skin and in other ways, and this loss we make good by what we drink. Besides pure water we use many other pleasant beverages, such as tea, coffee, cocoa, and lemonade. Many use strong drinks, such as beer, ale, porter, wine, cider, and spirits. But we can say little or nothing for these strong drinks. The only thing in them which is of much use to the body is the water they contain. They do much harm especially when taken in excess. Boys and girls should never drink them for they all contain *al-co-hol*, and every doctor says that alcohol can do nothing but harm to young people. Later lessons will show you why all strong drinks are hurtful and dangerous.

Some nations, like the Hindoos, who live in hot climates, eat no meat. Others, like the Es-quimaux, who live in the coldest parts of the world, eat no vegetables. A mixed diet, partly meat and partly vegetables, seems to be best for such a climate as ours. But whether we live on animal food, or vegetable food, or both, there are a few

important rules which all must keep if they wish their food to do them good and not harm.

(*i.*) It is a good habit to eat only at meal times, so that the stomach may have rest and not be always at work.

(*ii.*) It is a good habit to eat slowly. This gives us time to *mas-ti-cate* or chew our food properly.

(*iii.*) It is very important to be *temperate* in eating—to stop eating when we know we have had enough. Much illness is caused by over-eating.

(*iv.*) Never eat things which you have been told are hurtful—such as unripe or unsound fruit. It is also right to go to the table clean and neat; to wait patiently until you are helped; and to be always watchful and ready to pass anything which others may need.

con-di-ments, things taken with food to give it a relish.

mas-ti-cate, chew.

al-·o-hol, the hurtful thing in beer, cider, wine, and spirits.

SUMMARY OF THE LESSON.

Every part of the body is nourished by the blood, and the blood is made from our food and drink. Milk, eggs, and bread are called model foods, because they each contain all the food the body needs—viz., water, flesh-making food, heat-giving food, and some mineral food. The only drink the body needs is water. The worst drinks are those which contain alcohol. If we wish to be healthy we must be temperate in eating and drinking, eat slowly, and well masticate the solid food.

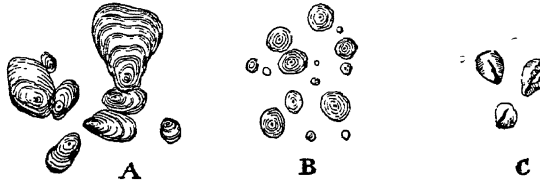
Lesson VII.—How Food is Prepared for Eating.

(1.) ONE evening when Mr. Price was digging up potatoes in his garden, the children were at the same time gathering some ripe berries from the gooseberry bushes. "How is it the gooseberries do not require to be cooked before we eat them, like the potatoes do?" asked Mr. Price. The children said that it was because the gooseberries were ripe. "But the potatoes are ripe also," said Mr. Price, "yet you cannot eat them until they are cooked. The truth is the warm rays of the sun have already cooked the berries. A short time ago they were green, sour, and hard, and quite unfit to be eaten; but the sun's warmth has made them soft and sweet, and has saved your mother the trouble of cooking them, unless she wants them for a pudding." "How nice it would be if we could eat all our food without cooking it!" said Jane. "How much time and trouble would be saved, and firing too!" "I do not think you would find it nice at all," replied her father. "Even if you could eat hard grains of wheat, would you enjoy them as much as the nice loaves of bread which we owe to the miller and baker? Raw beef can be eaten if it is minced; and it would digest sooner than cooked beef; but who would care to lose the nice flavour and pleasant smell of roast beef? One of the chief uses of cooking is to make food pleasant to the taste."

(2.) "There are not many kinds of food which can be eaten without cooking," said Harry. "No," said

Mr. Price, "we should find that some would be too hard for us to masticate. Cooking softens many foods, so that they are easy both to masticate and to digest. You can neither eat nor digest the hard, uncooked grains of rice; but when properly cooked they become soft and digestible. Indeed, there are few of our many vegetable foods which would be either pleasant or good for us without cooking, except ripe fruits."

(3.) "That reminds me," said Jane, "of what our cookery teacher said in her first lesson. She explained to us that good cooking is useful in three ways; it makes food more inviting to the appetite, easier to masticate properly, and easier for the stomach to digest. She also showed us how important good cooking is for health and comfort; and said there is little nourishment to be got out of good



(A) STARCH CELLS FROM POTATO.
(B) " " " WHEAT.
(C) STARCH CELLS BROKEN BY HEATING.

food unless it is properly cooked. In one lesson she told us why rice and potatoes become so soft and pleasant when cooked; but I think Sarah can explain it better than I can."

(4.) "Come, Sarah," said her father, "I should like to hear how the potatoes become so nice and floury when mother roasts or boils them." "I think I can make it plain, father," said Sarah. "Teacher told us that a potato is made up chiefly of *starch*; and that the starch consists of very fine grains shut up in tiny cells. The walls of these cells are formed of a hard, woody substance. When the potato is baked or boiled the heat swells the cells, until they burst and set free the grains of starch." "I hope you girls will learn how to cook a potato; there is nothing more unpleasant or harder to digest than a badly cooked potato," said Mr. Price. "Teacher told us," replied Sarah, "that the best way is to bake or boil potatoes in their skins, because just under the skin is some flesh-forming food which is lost when the potato is pared." "Your mother's potatoes are always nicely cooked," said Mr. Price, "and that is the chief thing. A good cook knows several ways of cooking food, and thus she is able to give us many pleasant changes even in our commonest foods. I have read that French cooks know nearly a hundred ways of cooking eggs, and if we counted the ways in which mother cooks them and the ways in which she uses them with other food, I think we should make a fairly large number." "When our teacher last spoke about eggs, she told us that they are easier to digest when raw than when cooked, and that they should only be cooked lightly," said Jane. "That is because the white part of the egg begins to get solid as soon as it is

heated," remarked Sarah, "and when it becomes solid it is hard to digest."

(5.) "Why should there be so many ways of cooking?" asked Jane. "There are roasting and baking, broiling and frying, boiling and stewing; would it not be simpler to keep to one or two ways?" "Yes, it would be simpler. The savage tribes seem to enjoy their food though they know little about cooking. But you would miss many nice dishes which you enjoy, and which you would not have, if mother made use of only one or two methods of cooking. Besides you must remember that some articles of food are best cooked in one way and others in another way; and that a method which is good for cooking a large quantity, say a joint of beef, would be absurd if used to cook a mutton chop. A good cook always know the best way to prepare food, so that it shall be both pleasant to eat and nourishing"

di-gest, dissolve so as to pass into the blood.
di-ges-ti-ble, able to be digested.

SUMMARY OF THE LESSON.

Cooking softens most foods so that they can be chewed easily and digested, that is, dissolved in the stomach. Some foods will digest quicker when uncooked than when cooked; but cooking gives them pleasant odours and makes them nicer to the taste. Cooking also enables us to have many pleasant changes, since almost any food stuff can be cooked in more than one way.

Lesson VIII.—How We Eat Our Food.

(1.) YOU have already learned that a good appetite for food is one of the signs of good health, just as loss of appetite shows something is wrong with us. You have also learned why we need food, and why the body cannot be healthy unless it gets regularly a sufficient quantity of suitable food.

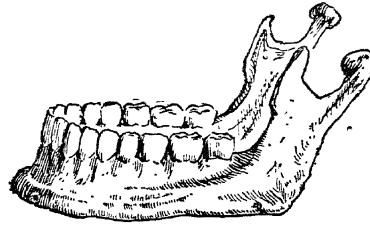
(2.) None of our food or drink can be of any service to the body until it finds its way into the blood. The blood is contained in small tubes, or *blood vessels*, as we call them. The walls, or sides, of the blood vessels are made of thin, moist skin, and whatever enters the blood must soak through these walls, or be *absorbed* as we call it. You know how blotting paper will absorb ink, and how a sponge will absorb water. But a sponge cannot absorb a solid substance. If I want a sponge to absorb salt or sugar I must first dissolve the salt or sugar in some liquid. A sponge cannot absorb a solid piece of salt, but it can absorb salt water.

(3.) This is why our solid foods must be *digested*, that is, *made into a liquid which can be absorbed.* Water needs no digestion, because it is a liquid and is easily absorbed. Bread and cheese, meat and potatoes and all solid foods, must be first digested, or they cannot become part of the blood.

(4.) When the green-grocer and butcher bring supplies of food to your house, it is put into the kitchen. There it is cut up, cooked, and so made

ready for use at table. It is much the same when food enters the body. It goes in by *the kitchen-door* (*the mouth*), and as soon as it enters, the *front teeth* begin to cut the large pieces into smaller pieces, and the *back teeth* to grind these pieces smaller and yet smaller. The mouth is not only a door to receive; it is also a cutting machine and a grinding machine. Besides this, it thoroughly moistens the food; for food cannot begin to dissolve without moisture.

(5.) When food is presented to the mouth, the lips and tongue receive it and draw it within. Then, as every part of the mouth is movable, the tongue, cheeks, and roof, or *palate*, move the food about, the front or cutting teeth cut it up, and the back teeth, or grinders, crush it and grind it. Have you ever



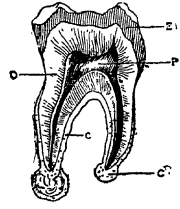
LOWER JAW WITH TEETH.

thought what a wonderful cutting and grinding machine the teeth make? Your teeth did not come until you were getting old enough to eat some solid food; and you only had twenty in your first set. Then, underneath the first set, another set began to grow, and push out the first teeth. All your second

set have not yet come. When the set is complete, you will have thirty-two, sixteen above and sixteen below.

(6.) You can easily see that the teeth differ in shape and size. At the front you will see eight *chisel-shaped* teeth for biting; next to them are four *pointed,* or tearing teeth, one on each side, above and below; then there are eight teeth, with *two points;* and, when the set is complete, there are twelve *grinders,* with three points each. These twelve are broad and rough—they are our grindstones. All the teeth are very tightly fixed in *sockets,* or holes in the jaw-bones.

(7.) The part of a tooth that you can see standing out from the jaw is called *the crown;* the part in the socket is called *the root.* As you



SECTION OF DOUBLE TOOTH.
(E) Enamel. (D) Dentine.
(P) Pulp. (C) Cement.

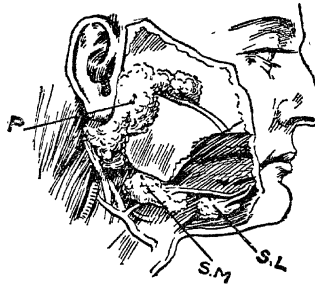
will already know, the root may have one, two, or three parts, called *fangs.* It is worth while learning how a tooth is constructed. You see in the sketch a section of a large, double tooth. The

whole of the crown is covered with a thin shell of white, shining *enamel.* This substance is very hard, the hardest in the body; it prevents the crown wearing away when we chew our food. Under the enamel is a hard, bony substance, or *dentine;* and in the middle you may see a much softer portion called the *pulp.* This contains blood-vessels and the nerve of the tooth. The *cement* helps to fix the tooth in the jaw. If by chance the enamel is broken, or begins to decay, the inner part decays too, and we suffer the severe pain known as tooth-ache, and may have to visit the dentist to get the bad teeth removed.

(8.) You cannot begin learning too early how to take care of your teeth. If taken good care of, they will probably be sound and useful until you get old. When the teeth become decayed, we cannot properly chew our food: besides this they give much pain and discomfort. Hence it is wise to form the habit of caring for the teeth daily. It is unwise to crack nuts, or any hard substance, with the teeth, for in doing so you may hurt the enamel which protects them from decay. You ought to brush the teeth with a soft tooth-brush at least once a day; and it is a good practice to rinse out the mouth after meals. This removes the small particles of food which get between the teeth, begin to decay, and help to make the teeth decay. The bad habit of smoking also discolours the teeth and helps to make them decay.

(9.) You have often noticed that as you chew

your food it becomes moist. The mouth is kept moist with a clear, watery liquid — *the sa-li-va:* when we chew our food, the saliva begins to run into the mouth and mixes with it. There are six little organs which make and supply the saliva. Any organ in the body which makes and supplies



a liquid is called *a gland.* There are six glands giving saliva to the mouth. The sketch shows you the positions of the three glands on one side of the head. Saliva not only moistens the food and makes it easy to swallow; it helps to digest all our starchy foods, such as bread, corn-flour, arrow-root, and potatoes. Starch does not easily dissolve: therefore it will not digest. But there is something in the saliva which changes starch into sugar. This is why bread tastes sweeter when we well chew it. The saliva begins to change starch, which will not dissolve, into sugar which easily dissolves: here is another good reason why food should be

well chewed. Tobacco makes the saliva run: hence the smoker frequently spits—a very unclean habit. Besides this, the useful saliva is wasted.

pal-ate, the roof of the mouth.

sa-li-va, the liquid that comes into the mouth when we are eating.

par-ti-cle, a very small part.

SUMMARY OF THE LESSON.

The process by which food is dissolved so that it can enter the blood is called digestion. This process begins in the mouth. The front teeth cut up the solid food; the back teeth grind it; the cheeks and tongue move it about, while the saliva mixes with it and makes it into a pulpy mass, easy to swallow. Saliva begins to change the starchy foods, which will not dissolve, into sugar which dissolves easily.

Lesson IX.—Useful and Pleasant Drinks.

(1.) IN Lesson VI. you learned that the body requires much water. You also learned that some solid foods contain a good deal of water. One pound, or 16 ounces of bread, contains over 6 ounces of water; a pound of beef contains about 11 ounces; and a pound of potatoes contains no less than 12 ounces But even this large proportion of water does not supply all the body needs: we feel the want of drink as well as of solid food.

(2.) Water forms the larger portion of all the

useful drinks. It is the one drink the body must have, and children need no other drink to keep them in perfect health. Tea and coffee are pleasant drinks; milk and cocoa contain nourishing foods as well as much water; but the only natural drink is the pure water which God supplies so freely and abundantly. Perhaps there is nothing more wonderful and beautiful than water and the way God supplies it. Sometimes it falls in gentle showers; sometimes it settles unseen on the blades of grass as sparkling dew drops. It rattles on the ground in a storm of hail, and silently clothes it with a pure white garment when snow falls. In winter it covers our ponds and rivers with a hard, smooth floor of ice, on which the skater glides easily along; and it makes the great icebergs which the sailor fears. The clouds above, and the fogs and mists below, are only other forms of this wonderful thing we call water.

(3) It would take a whole chapter to tell you of half its many uses. At present we can only think of the work it does in the body. *It does more to build up the body than any other substance.* This explains why men can live longer on water without food, than on food without water. *It dissolves many foods and thus assists digestion. It forms the larger part of the blood, which carries the digested food into every part of the body. It also collects and carries out of the body all its waste, worn-out particles.* No other liquid can do as much for the body as water can. But we must take care that it is fit to drink. Good drinking water is

perfectly clear, and has neither colour nor smell.

The purest water is *rain water;* not rain water after it has run down dirty roofs and spouts, but rain

water when it is falling. Yet you would not care to drink it because it is so *in-sip-id.* The water we drink comes from springs, rivers, and mountain lakes. It is not perfectly pure, for it dissolves air as well as some of the mineral substances it passes through. When the water dissolves lime it is what we call *hard water.* When water is not properly clear it ought to be *filtered.* But it may be clear to the eye and pleasant to the taste, and yet be quite unfit to drink. Sometimes there are impurities in water which can only be destroyed by boiling it. Whenever we are obliged to drink water from a well, pond, or stream, it is better to boil it before drinking, unless we are sure that nothing hurtful drains into it.

(4.) You take other drinks besides water, and it is well you should know something about their nature and their uses. Many parents never give tea or coffee to their younger children, for these drinks are not good for them. Good, warmed milk, to which water has been added, is the best drink for children to take at breakfast and tea time. You have already been told that the milk contains nourishing food.

(5.) You have all seen your mother take some of the dry curled-up leaves which we call tea from her tea-caddy and pour boiling water upon them. The clear hot water soon changes colour, and gets the same fragrant smell which belongs to the dry tea. You have heard that these leaves are carefully collected from the evergreen tea plant, which is grown in India, Ceylon, and China. Tea is not

good if it is allowed to boil or stand long. Indeed, though it is so pleasant a drink, it is not good for children or delicate people; neither is it good for the grown-up and active when it is taken very often and strong.

(6.) Coffee is another popular drink which is much used at breakfast. You have seen the brown

THE TEA PLANT.

LEAVES & FLOWERS OF THE TEA PLANT.

powder which we call coffee; and some of you have seen the roasted, brown berries which are ground into this powder. The berries are seeds found in the fruit of the coffee tree. This tree only grows in Arabia, and other very hot countries. Like tea, it is not a good drink for children. Older people find both these drinks pleasant, refreshing, and

stim-u-lat-ing, and it is far better to use them than to drink any kind of strong drink.

(7.) There is an evergreen tree much like a cherry tree growing in South America and the West Indies.

BRANCH OF THE COFFEE TREE.
Flower. Seeds within the Fruit.

Its fruit is a large, brown pod, filled with seeds looking in shape and size like beans. They are the seeds of the cocoa tree, and cocoa and chocolate are made from them. Cocoa is a pleasant drink,

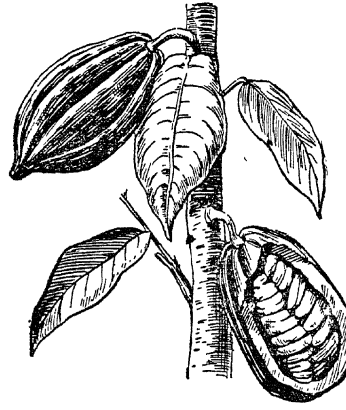
and it contains much nourishing food. It is a far better drink for children than either tea or coffee. Cocoa contains much fat called "cocoa-butter;" some of this fat is removed from most of the

COCOA TREE.

cocoas sold by the grocer, so that they may not be too rich for the stomach.

(8.) Whatever drink you take, it is well to remember the important rule of temperance, and never drink more than you really need. Some people drink

too much tea; others drink too much coffee; and



COCOA PODS: One opened to show the Seeds.

others take their tea or coffee too strong. Do not forget that all excess is hurtful, and should be avoided.

in-sip-id: without taste.

stim-u-lat-ing: exciting, or arousing us, when we feel tired or out of spirits.

SUMMARY OF THE LESSON.

The greater part of our body is built up of water; therefore it needs water more than any other substance. It gets a good deal of water from the solid food, and the rest from what we drink. The only drink the body really needs is pure water: God has plentifully provided this in many ways. Tea and coffee are pleasant, stimulating drinks, but are not so good for children as water, milk, and cocoa. We must be temperate in the use of drinks: even useful drinks become hurtful when taken to excess.

Lesson X.—Some Drinks We Should Not Touch.

(1.) THERE are many drinks which it is best for you to avoid altogether, because, while they can do you no good, they may cause you very much harm. Some of these drinks are made from the juices of ripe fruit, such as grapes, apples, pears, currants, and oranges. The juices of all ripe fruits consist chiefly of two things, sugar and water; and it may seem strange to you that harmful drinks can be made of these useful things. But when these juices are exposed to the air, the sugar in them begins to change into substances altogether different. If we could only keep the air from them the change would not take place.

(2.) If you want to watch this change going on, you should put a table-spoonful of common moist sugar into a jar containing about one pint of water slightly warmed. Then put into the sweet liquid a little bit of the dried yeast called *German yeast*. Cover up the jar and put it in a warm place. In about an hour or so you will see some strange changes taking place. You will see the liquid moving about and bubbles rising to the surface and bursting. This will go on for some time until all the sugar is changed. What does it change to? To *a gas*, which you see passing off in bubbles, and to *a liquid* which was not there before. This liquid is called *al-co-hol*: it is this liquid which makes strong drink *in-tox-i-ca-ting*.

(3.) You will be surprised to learn that a small bit of dry yeast consists of thousands of little plants. The sketch shows you that the yeast plants are round in shape. If they are put into a

YEAST PLANTS.

liquid with sugar dissolved in it, each plant begins to grow. It is the sugar which makes it grow. One tiny plant grows out and separates from another. This goes on rapidly, so that a few yeast plants will soon produce many millions. But all the while *the sugar is changing into a poisonous gas which escapes in bubbles, and into a poisonous liquid called alcohol which remains.* This change is called *fer-men-ta-tion ;* and any substance which causes fermentation is called *a ferment.*

(4.) You have been told that the sweet juices of fruit begin to ferment without our adding any yeast if they are exposed to the air. They do so because the air we breathe is full of invisible, floating particles. Among these floating particles there are many which are ferments ; and whenever a ferment settles on a sweet liquid, fermentation at once begins. Now you can understand how the intoxicating drinks called *wines* are made. Most wines are made from

ripe grapes, the beautiful fruit of the grape-vine, so pleasant a fruit to eat, so beautiful to look upon. The grapes are gathered in baskets, and carried to a large trough. There they are crushed, sometimes by men's feet trampling upon them, and sometimes by passing them through rollers. Fermentation begins at once, for many of the yeast plants floating in the air settle on the outsides of the grapes, and supply the ferment. The wines from France, Spain, Portugal, Italy, and other wine-making countries, have many different names, but they are all made in the same way; they all contain alcohol; they will all make men drunk; and therefore they are dangerous, hurtful drinks, which had better be avoided.

(5.) Ours is not a wine making country, because the grape vine does not grow well out of doors; but *apple wine*, or *cider*, is made in Devonshire, Worcestershire, and other counties; and *pear wine*, or *perry*, is also made. Cider and perry are made from the juices of apples and pears, just as wine is made from the juice of the grape. People can be made drunken by drinking cider and perry, because these drinks contain as much alcohol as grape wine. Sometimes people foolishly think that because they make wine at home from currants, oranges, elderberries, and other fruits, and put no alcohol in, that they are harmless. This is a great mistake. Yeast is always put into the fruit juices, and some sugar is generally added; fermentation begins, and an intoxicating drink is always made. Do not be deceived if anybody offers you either *cider*, *home made wines*, or *British wines*. They are

all made by fermentation, and therefore they all contain the intoxicating liquid called alcohol.

(6.) Wines seem to differ from one another in many ways, and especially in colour, taste, and smell. If we give them to a chemist he can *analyse* them for us, that is, tell us exactly what materials are in them. He tells us that they are really very much alike, that they all contain a good deal of water, more or less alcohol, or spirits of wine, as it is called, and some dissolved solid substances—such as sugar, gum, colouring matter, and cream of tartar. These solid substances differ in different kinds of wine; this is the reason why wines differ in taste and appearance, for the water and alcohol are the same. One pint of cider, or 20 ounces, contains about 18 oz. of water, 1 to 2 oz. of alcohol, and about one ounce of dissolved solids. Pure wine, that is wine made by the fermenting juices of fruit, rarely contains a larger share of alcohol. But more alcohol is often added to cider, to home-made wines, to British wines, and to foreign wines, to make them stronger. There may then be as much as 3 or 4 oz. of alcohol to every pint. As alcohol is the hurtful part in all strong drinks, these strong wines do far more hurt than the weaker ones.

(7.) Is there any useful nourishing part in wines? Yes, the water is useful; but people do not drink wines for the sake of the water. The sugar and the gum are useful, for they are foods; and the cream of tartar is useful. But wines are not drunk for the sake of the very small amount of food they

contain. If wine be gently heated for a time, all its alcohol will pass off as invisible vapour, leaving only the water and the solids. No wine drinker would care to drink these. It is the alcohol which made the wine pleasant to him. And alcohol, as we shall learn, is so dangerous a liquid that they are the wiser who never take drinks containing it.

in-tox-i-cat-ing: able to make people drunk.

SUMMARY OF THE LESSON.

A bit of dry yeast, or a drop of brewer's yeast, is a mass of tiny yeast plants, which begin to grow if they are put in any sweet liquid. As they grow they change the sugar into a poisonous gas which escapes in bubbles, and into a poisonous liquid known as alcohol. This change is known as *fermentation:* the yeast which produces the change is called a *ferment.* Cider, Perry, Home-made Wines, and Foreign Wines are all made by fermentation. They all contain alcohol, which intoxicates, and therefore they should not be used as drinks.

Lesson XI.—Other Drinks which Should not be Touched.

(1.) IF men and women drank cider and wine very sparingly, and only with their food, perhaps these drinks would do little harm. But it is well to remember always two facts about *intoxicants.* First: Thousands of people nowadays never drink them at all, and yet have perfect health. This shows that strong drinks are not necessary for good health. Second: It is wise to remember that the liking for intoxicating drinks often grows stronger and stronger until the poor drinker cannot do without them. *They*

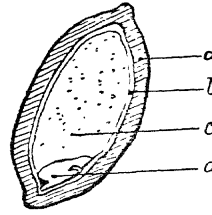
master him, and he becomes their victim. Cider makes its victims in cider-drinking countries; wine has its victims in the wine-growing countries. In

EAR OF BARLEY.

our own beloved land it is the different sorts of *beer* and *spirits* which are the ruin of so many.

(2.) *Beer*, *porter*, and *ale* are called *Malt-liquors*, because, when pure, they are made from *Malt*. The grains of malt are made from grains of *Barley*. What a pity it is that good, useful food like barley should be spoiled to make intoxicants! Remove the outside

husk of a grain of barley and you will find the grain is a mass of white starch, with a tiny plant, or germ, ready to begin growing, as you see in the diagram. The starch is the food on which the tiny

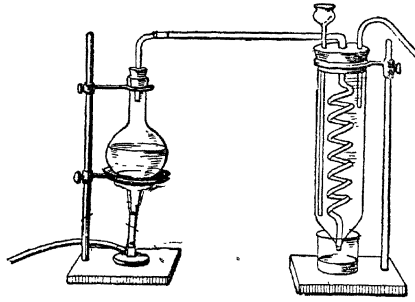


(A) HUSK. (C) STARCH.
(B) INNER SKIN. (D) GERM.

germ lives until it can find food for itself. When the seed is sown and gets moist and warm under ground, the starch begins to turn to sugar, just the food the little plant needs.

(3.) This will help you to see clearly what malt is. The maltster who makes malt, first soaks his barley in water to make it sprout—that is, *begin to grow;* then he puts the sprouting barley in heaps on a hard floor, where it continues to sprout. As it grows the starch turns to sugar. Then he dries the changed barley and calls it *malt.* Why does he make malt? To sell to the Brewer who brews ale and beer. The Brewer, having crushed the malt, puts it into boiling water to dissolve all the sugar. He passes the sweet liquid, *sweet-wort,* through a sieve and then adds yeast. What change will at once begin? The change

you learned to call fermentation. The starch in the barley became sugar in the Malt-house. In the Brewery the sugar changes to alcohol and the poisonous gas which escapes. Porter, ale, and beer differ in colour and strength ; but they all contain much water, more or less alcohol, and a little sugar, gum, acid and mineral food. Weak beer contains about as much alcohol as cider ; and strong ale contains as much as is found in strong wine.



SIMPLE FORM OF STILL.

(4.) But wines and malt-liquors are not the most dangerous forms of strong drink. Gin, rum, whiskey and brandy are far more dangerous because they contain a larger share of alcohol. In a pint or 20 ozs. of ale, there are only about 2 ozs. of alcohol : in 20 ozs. of brandy there are as many as 10 ozs. of alcohol ; so that about one-half of any quantity of spirits is alcohol. It is no wonder that spirits do such terrible mischief to those who have

formed the habit of drinking them. But how are these strongest and most hurtful of drinks made? They are made from beer and wine, the weaker drinks. If a weaker drink is shut up in a vessel and heated to a point just below boiling-point, the alcohol will pass off as vapour, and leave most of the water behind it. If this vapour pass through a coiled tube running round another vessel kept filled with cold water, the alcohol and water vapour will be *condensed*, that is, turned back into drops of liquid. This second liquid has far more alcohol in it than the first, because all the alcohol passes off as vapour at a much less heat than it requires to drive off all the water. The *ap-par-a-tus* used is called a *still*, and the process is known as *dis-til-ling*. Pure brandy is distilled from wine; rum and whiskey are distilled from the liquid obtained from different grains after they have been malted, boiled in water to extract the sugar, and then fermented.

(5.) You have now learned the three classes of strong drinks: *malt-liquors*, *wines* and *spirits*. Many wise and skilful doctors tell us that the body does not need them even when used in strict moderation. All doctors agree that they can only do harm to children and young people. Hundreds of thousands of children are now growing up, who never taste beer, cider, or home-made wine; and you will be wise to follow their example.

(6.) But the question may occur to you "How is it that intoxicants are so much used as drinks, not only by drunkards, but by those who live sober and useful lives?" People drink them for many reasons.

Some think they are really useful, liquid foods In another lesson you will learn why many doctors say that these things are not foods and cannot impart bodily strength. Others drink them because they think these drinks help the stomach to digest food; while some say they get a better appetite by drinking a little beer or ale. Many unfortunately drink them because they have learned to like them and do not care to try to do without them. These are the people to whom strong drinks are most dangerous. Is it not wiser never to begin drinking what can do us no real good, and may cause us fearful injury? You should learn the following words, spoken by two very famous and skilful physicians, about intoxicating drinks. Sir Andrew Clark said: "*Perfectly good health will, in my opinion, always be injured even by small doses of alcohol.*" Sir William Gull, another skilful and learned physician, said: "*I hardly know any more potent* (powerful) *cause of disease than alcohol.*" Is it not unwise to learn the habit of drinking that which one famous doctor says always injures good health, and another equally famous doctor says is powerful in causing disease?

SUMMARY OF THE LESSON.

Beer, Ale, Porter and Stout are called malt liquors because they are, when pure, all made from malt. Malt is made from barley; in the process of malting, the starch in the barley becomes sugar. The sugar is dissolved out of the malt by boiling water. When yeast is added, fermentation begins and alcohol is formed. Strong ales and wines contain about the same share of alcohol. The strongest of the strong drinks are called spirits. They are obtained from wine and fermented liquors by a process called distillation.

Lesson XII.—Alcohol, the Hurtful Part in Strong Drink.

(1.) YOU have learned that alcohol is the hurtful, dangerous liquid which forms part of all intoxicating drinks, from the weakest cider to the strongest brandy or whiskey. In the last lesson you were taught that if an intoxicating liquor be gently heated the alcohol begins at once to leave it as an invisible vapour. If some spirits be heated in this way, and a light be put to the vapour as it escapes, you will see the vapour burning.

(2.) It is not easy to get perfectly pure alcohol, because it has such a strong attraction for water. Those who have seen the clear, colourless, transparent liquid called *spirits of wine*, have seen nearly pure alcohol. If some spirits of wine be coloured with a few drops of red ink, and then poured very gently on water, you will see the spirits of wine floating on the top of the water: this shows that alcohol is lighter than water. Except in its looks it differs from water in almost every respect. Neither water nor water vapour will burn; both liquid alcohol and the vapour burn with a hot flame which gives no smoke and very little light. Pure water has no smell and little taste; alcohol has a sweetish, sickly smell, and a hot burning taste which inflames the mouth. Alcohol will not freeze: water, as you know, freezes easily. If a bit of bread, or a slice of apple, or a bit of meat, or piece of potato be left in alcohol, it gets *hard*. If these things be

put into water they get *soft*, and begin to separate into shreds. You will find it useful to remember that while water softens most food substances alcohol hardens them. This is the reason why small animals, fishes, snakes, fruits, and other natural history specimens, are put into spirits of wine *to be preserved*. On the other hand, it is worth knowing that alcohol will dissolve resin, camphor, sealing-wax, and other things which will not dissolve in water. The druggist often makes use of it as *a solvent*, that is, a substance which will dissolve many things.

(3.) Alcohol, as you see, has some valuable properties. But it has one property which should teach everybody to be very cautious how they use it. Chemists put alcohol among that class of things which they call POISONS. A poison is a substance whose effect is to destroy life. Small quantities of alcohol do not kill; but a large draught of pure alcohol would kill immediately the person who was so foolish as to drink it. There are many dangerous poisons besides alcohol which do much mischief, even though they do not kill when taken in small quantities. Arsenic, opium, and nicotine, the poisonous substance in tobacco, are all dangerous poisons; but people can take them in small quantities without being killed.

(4.) Different poisons tend to destroy life in different ways, and it is right you should know what kind of poison alcohol is. It is what doctors call a *nar-cot-ic poison*, that is a poison which, taken in small quantities, deadens pain, serves to quiet the nerves, and produces sleep, but if taken in large

quantities makes us insensible and puts an end to life altogether. Opium, chloroform, the nicotine in tobacco and alcohol, are narcotic poisons. There are certain things in which all narcotics are more or less alike. They all seem to soothe us when weary and worried, to lull pain, to make us forget our cares and troubles and thus raise our spirits. Hence many begin to take them for the comfort they seem to give. But if they seem at first to be *comforting friends* they too often turn out to be *treacherous foes.* Alcohol, like every narcotic, makes a growing desire for itself, so that some who take but little at first soon get a craving for more. Little by little this craving increases until it gets to be master, and the poor victim cannot say "*no*" to his awful desire for what he knows is doing him harm. This is the way drunkards are made. The craving for drink does not grow equally fast with all who drink. No one who begins to use narcotics sparingly can tell how long he will be satisfied with a little. This is one of the chief reasons why it seems wise never to begin to use strong drink, or any other of these dangerous and most treacherous foes. The best advice we can give our readers, who wish to grow up strong and healthy in body and mind, is never to begin either drinking intoxicating drinks or smoking tobacco.

(5.) There are several properties of alcohol which you ought to know, so that you may understand what will be said in future lessons about the mischief it does in the body. You were told at the beginning

of this lesson that pure alcohol inflames the mouth with its stinging, burning taste. What it does to the tender skin in the mouth it will do to the tender skin which forms the lining of all the inner parts of the body. Of course spirits, the strongest of the strong drinks, irritate and inflame more than the weaker kinds, which do not contain as much alcohol.

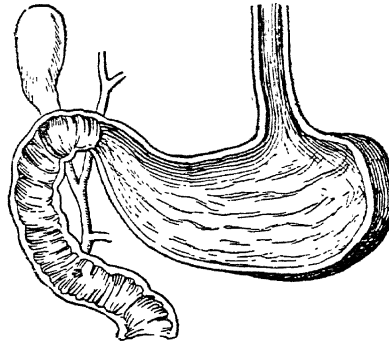
(6.) Alcohol has a wonderful attraction for water. It takes up and mixes with water wherever it can find it. If a lean piece of meat is weighed, and then put in strong alcohol for some days, it is found to be much lighter, drier, and harder when taken out of the alcohol than it was before it was put in. This is not difficult to understand. The alcohol robs the meat of the water which made it moist. As the meat loses its water, of course it becomes lighter, drier, and tougher. These two properties of alcohol—its inflaming property and its attraction for water—will help you to understand why it is that alcohol hinders the digestion of food.

SUMMARY OF THE LESSON.

Alcohol is a transparent, colourless liquid, like water in appearance, but differing from water in almost every other respect. It will not easily freeze; it burns; it boils at a lower temperature than water. It has a sweetish smell and a hot, burning taste. To the druggist it is very useful, because it will dissolve many substances, such as resin and camphor which do not dissolve in water. Alcohol is reckoned as one of the poisons, because it can destroy life. It is a narcotic poison—that is, one of those poisons which deaden pain, and produce sleep. It has a great attraction for water, and hardens many foods by robbing them of water.

Lesson XIII.—How Food is Digested.

(1.) IN Lesson VIII. you read that food must be *digested*, that is, brought into a liquid state, so that it can easily be absorbed. You also read how the teeth prepare the solid food for digestion by grinding it small; and how the saliva both moistens it, so that it can be easily swallowed, and also begins to turn the starchy part of the food into



THE STOMACH.

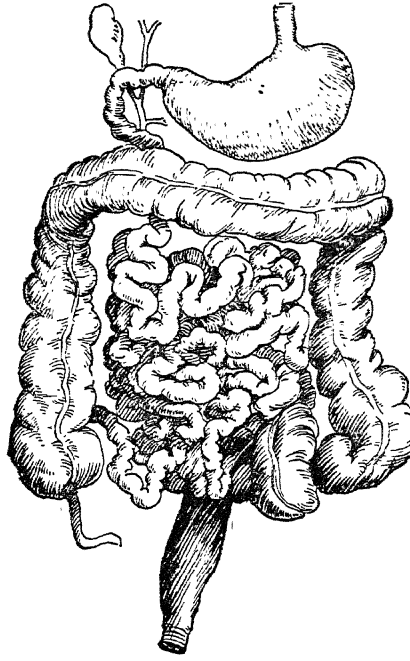
sugar. Where does it go to when it is swallowed? It goes down the *gullet*, or food pipe, into a fleshy pear-shaped bag called the *stomach*. The stomach is in the centre of the trunk of the body. It has two openings—the gullet opening by which it receives food, and a lower opening by which the food leaves

it and passes into the *in-tes-tines*. The stomach bag is made up of several layers; one of these layers is full of muscles which keep the stomach moving when food enters. The inner lining is pinkish in colour and is full of tiny glands: these glands make what is called the stomach juice, or *gastric juice*, and pour it into the stomach when food is waiting to be digested.

(2.) Gastric juice is one of the juices which help to digest the food. It is nearly all water, but it has an *acid* in it, and a very important substance called *pep-sin*. It digests the *flesh-forming foods*, such as lean meat and white of eggs. But it cannot digest the fatty foods. These, and all the partly digested foods, pass as a thickish liquid called *chyme* through the other opening of the stomach into a very long and folded tube called the *in-tes-tines*. In the intestines the fatty food is digested by means of a liquid called *the bile*, which comes from *the liver*, the largest gland in the body. Another juice, known as the *pan-cre-at-ic juice*, because it comes from an organ called the *pan-cre-as*, also joins the chyme: it dissolves the undigested starchy and other foods. As the food is digested, it is absorbed by the moist walls of the stomach and intestines, and so finds its way into the blood.

(3.) Have you ever read, in that very old story of the stomach and the other members of the body, what happened to the hand, the eye, the limbs, and all the other parts, when they refused to supply the stomach with food? The story helps us to remember how much the health and comfort of the body

depend on the stomach and the organs which assist it in doing its work properly. The food is of no



STOMACH AND INTESTINES.

use to us unless the organs digest it; and unless they digest it thoroughly it cannot nourish us as it should. When a person suffers from *in-di-ges-tion*,

that is, bad digestion, he has to endure much pain and discomfort: he cannot eat and enjoy foods which others benefit by. Perhaps no disease is more common than indigestion, and there is no bodily ailment we can more surely keep free from. It is not a contagious disease, like measles or scarlet fever. As a rule, those who suffer from it have only themselves to thank for it.

(4.) *Eating too much, eating too fast* and *eating too often*, are common causes of indigestion. The first gives the stomach more work than it can do; the second expects it to do the work of the teeth as well as its own work; and the third robs the stomach of what it must have if it is to keep healthy, *sufficient rest between meals.* It is important to be regular with our meals, and not to go too long without food.

(5.) If we want to keep healthy stomachs, *we must mind what food we put into them.* Plain food, well-cooked, is what we should be thankful for and satisfied with, for it is what the body needs. Rich dishes, highly-seasoned food, and things which we know do not agree with us, should be avoided. Vinegar and pickles and other condiments ought to be used very sparingly.

(6.) *We must mind how and what we drink at meal times.* It is not good to drink very much of any liquid when we are eating a good meal. Too much liquid dilutes the stomach juice; and too much cold water at meal times lowers the heat of the stomach and hinders digestion. The wiser plan is to drink but little until the meal is finished.

Tea and coffee should be taken always with moderation, for they rather hinder than help the digestion of food. Tea should be drunk very soon after it is made; when allowed to stand, or when taken too strong, it is hurtful.

(7.) But it is the *strong drinks* and above all *spirits*, which work most mischief in the stomach, especially when taken frequently. They hurt the inner coat of the stomach by irritating and inflaming it. They harden the food and thus make its digestion more difficult. They alter the gastric juice, so that it cannot properly perform its useful work. People often take a little beer or wine thinking it helps to digest food. It seems, perhaps, to give an appetite, for there is a bitter substance in some beers, and acids in all strong drinks; and it is these things, and not the alcohol, which seem to sharpen the appetite. But the stomach which needs these helps cannot be in a healthy state; and alcohol can do nothing but harm to a weak stomach. Another harmful effect of strong drinks is the mischief they do to the liver. The livers of those who drink much strong drink are always unhealthy. You will recollect that the work of the liver is to make the bile, which helps to digest the fatty foods. There is no doubt that strong drink taken regularly, even in moderate quantities, hurts the liver, and thus hinders its necessary work.

(8.) Another common habit which certainly hinders digestion is *smoking*. It helps to destroy the teeth which masticate the food; it irritates the glands which supply the useful saliva, and thus causes the

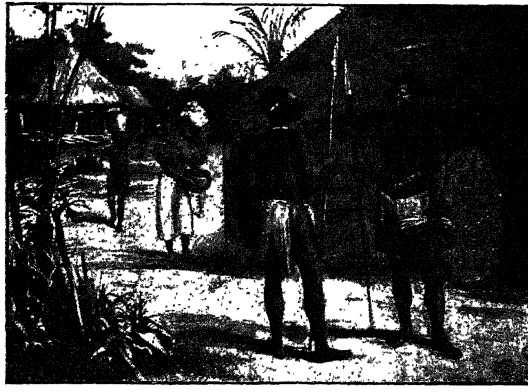
unpleasant habit of spitting; it makes the throat dry, and may encourage drinking; and, as you will learn further on, it hurts the body in other ways.

(9.) What will help the stomach to do its work well and to keep itself in perfect health? *Temperance*, which means *self-control in all things;* plain, wholesome food, well cooked, and slowly eaten; regular exercise in the open air; and abstinence from harmful things, such as strong drinks and tobacco.

SUMMARY OF THE LESSON.

Digestion begins in the mouth when the food is masticated and moistened with the saliva. In the stomach the flesh-forming foods are digested; in the intestines the fatty and most of the starchy foods are digested. No food can enter the blood until it has been first digested and then absorbed by the moist, inner coatings of the stomach and intestines. Indigestion is a painful and common disease. People who eat *too much*, *too fast*, and *too often*, are likely to suffer from indigestion. The regular use of strong drinks and of tobacco also causes indigestion.

Lesson XIV.—Some Things Which are Not Food.



(1.) JANE PRICE much amused her brothers one evening when she told them about certain tribes of negroes in Western Africa who, when food is short, eat a yellowish earth, and seem even to get fond of it. Harry began to make fun of her, and said she would believe any foolish thing which people might tell her. But Sarah said Jane was only repeating what their cookery teacher had told them at school. "She also told us," said Sarah, "of an Indian tribe living on the banks of a river in South America who, when the water gets low and fish becomes scarce, collect and eat a kind of

tasteless clay. They seem to take it to make up for the short supply of better food, and, at any rate, they do not suffer from empty stomachs."

(2.) "But, Sarah," said Mrs. Price, "does not this earthy food do them harm?" "No, mother," answered Sarah. "It appears to do them little, if any, harm. Our teacher told us that earthy food is occasionally eaten by many tribes, who appear to be but little the worse for it. Of course it contains hardly any nourishment; but teacher says it helps to stay the pangs of hunger. Our teacher also surprised us by saying that, even in our own village, there are not a few people who take as food what contains no real nourishment, and even things more hurtful than the earthy food of the savage."

(3.) "I can well believe your teacher is right," said Mr. Price. "There are a good many who think that threepence spent on a pint of ale is as useful as three pennyworth of bread and cheese. Many years ago, before *Bands of Hope* and *Temperance Societies* began to teach us better, most people thought beer was liquid bread. They said, 'Beer is brewed from malt, and malt is made from barley; therefore the beer contains barley-meal in a liquid form.' Now everybody may know, if they will, that the starch-food in barley becomes sugar-food in the malt, and that the useful sugar-food is destroyed in brewing and changed to hurtful alcohol."

(4.) "But is there no food at all in strong drink?" asked Richard, in his weak, thin voice; for his bad health did not hinder him taking a keen interest

in what the others talked about. "When I was so ill last spring, Dr. Turner ordered me some wine, saying I needed something to make me strong." "Yes, Dick," replied Mr. Price, "but the doctor ordered you wine, not as a food, but as a medicine. He thought a few spoonfuls of wine and water might help to give you a relish for food when your appetite was failing. There is, I am told, a little food in a glass of wine or beer, because there is always a small quantity of sugar and gum in it. But it is said by those who know, that even a pint of wine or ale does not contain as much true food as could be placed upon a sixpence. Grapes are good as food, and barley is an excellent food, but the food substances in them are destroyed when they are made into wine and beer."

(5.) "Miss Stevens, the cookery teacher," said Sarah, "gave us a very nice lesson on food, and showed us that all real foods do one of two things: they either make flesh and bone, or they are slowly burned up in the body and keep it warm. She also explained to us that every flesh-forming food contains a substance which she called *nitrogen*." "I known what that is," interrupted Tom. "The other day we had a lesson on air. Mr. Harvey said that there is very little in air besides two invisible gases called oxygen and nitrogen." "Well," continued Jane, "it appears that every flesh-forming food contains nitrogen. But the teacher said that alcohol contains no nitrogen at all, and that this proves the alcohol in strong drink is not a flesh-forming food."

(6.) Mrs. Price said: "I can well believe that strong drink does not build up strong, healthy limbs; but I always thought it helped to warm the body. It seems to warm and cheer up those who take it. How briskly old Noakes the cobbler hobbles home, and what a warm, red face he has, when he has had his morning glass at the 'Red Lion'!" "I always thought as you do, Mother," said Mr. Price, "but I begin to doubt whether a glass of ale or spirits is the best thing to warm a man when he is thoroughly chilled. I saw in the newspapers that the ships sent out to try and reach the North Pole take plenty of nourishing food, together with tea, coffee, and cocoa; but they take neither beer, wine, nor spirits, excepting a small quantity of brandy for the doctor to use as a medicine. Surely if alcohol were a true heat-giving food, it would be the very thing required by those who have to endure the continued and terrible cold of an arctic winter. I have often heard, that the kindest thing we can give to anybody who has to face severe weather on a winter's night, is not beer, nor a hot glass of spirits and water, but a good slice or two of bread with plenty of butter, and a jug of hot cocoa."

(7.) "That is quite true, father," said Sarah. "The bread contains both flesh-forming and heat-giving food. Good butter is a splendid heat-giving food; and so is the cocoa-butter, which is the fatty part of cocoa. Miss Stevens made it very clear to us that, even if the alcohol is burnt up in the body, it is not a proper heat-giving food. She told us that if a person's temperature is taken

soon after he has eaten food, it always *rises;* but if it be taken after alcohol is drunk, it *falls, and keeps lower for some time.* Alcohol makes the skin red and flushed because it drives the warm blood to the surface of the body; but it certainly does not warm the body as food does."

(8) "I heard old Nichols say that he would sooner go without his food than his pipe," said Harry. "Do you think, father, there is any real nourishment to be got from tobacco smoke?" "I do not think old Nichols would find tobacco would do instead of food. The fact is, he has smoked daily for many years, and the craving for tobacco becomes almost as strong as the drunkard's craving for drink. The pipe comforts him, no doubt. It may perhaps, for a time, lull the craving of a hungry stomach for food. But there is no food substance in tobacco, and, if there were, there would be none of it in the smoke. Tobacco does not add one particle to the body, nor does it supply strength to the muscles. Like alcohol, it hinders the growth of growing boys, and hurts the mind by making it the slave of a bad habit. I hope none of my children will become either smokers or drinkers."

SUMMARY OF THE LESSON.

Some people think that beer is a liquid food because it is made from malt; and that wine is an article of food because, when pure, it is made from grapes. But the food substances in malt and wine are nearly all destroyed in brewing the beer and making the wine. What wine, beer, and spirits consist of chiefly is water and alcohol. The amount of solid food substances dissolved in them is so small that it is of no account. So that if alcohol is not itself a food, we may truly

say that in strong drinks the food part is not worth taking into account. Alcohol contains no nitrogen, so that it cannot be a flesh-forming food. The heat of the body always falls after strong drink has been taken ; hence alcohol is not a useful heat-giving food.

Lesson XV.—Tobacco.

(1.) TOBACCO, as most of you know, is prepared from the dried leaves of the tobacco plant. The habit of smoking tobacco was first introduced

into England in 1586, during the reign of Queen Elizabeth, by Sir Walter Raleigh. He had found it very generally indulged in by the natives of America, the home of the tobacco plant. To many Englishmen the habit of smoking seemed at first strange and disgusting; and King James I. wrote a book against it. Nevertheless the habit spread with remarkable rapidity. It was found that almost wherever the plant was introduced it would grow fairly well, although a hot climate and a sandy soil suit it best. It has nowhere found a more agreeable home than in its native land—America, where it flourishes, especially well in Virginia, and the Island of Cuba. Tobacco is also largely grown nowadays in Turkey, Egypt, several countries of Europe, India, and China.

(2.) Here is a picture of the plant. It grows to a height of from 3 to 5 feet, and, as a rule, not more than twelve of its fine, large, green leaves are allowed by the planter to remain on one stem. The flowers are white and sweet-scented, and some of you who live in large towns may have purchased in recent years small tobacco plants for your gardens, and have noticed how the flowers open out and smell best in the evening.

(3.) Before a tobacco plantation is sown, very careful preparation of the ground is necessary. It has to be thoroughly cleared, all stumps being patiently removed; and every two years it must be thoroughly manured. The ashes of a pipe or cigar consist almost entirely of mineral matters, a valuable form of plant food which has been taken by

the plant from the earth. The seed is sown in August, and when there are a dozen full grown leaves on the plant, the stems are cut off close to the ground and are then carried to a large shed known as the drying house. Here they are first of all laid in heaps and covered with mats; but afterwards the leaves are strung together in rows, hung up, and allowed to dry. They are then sorted, tied in bundles, and pressed.

(4.) Some sailors chew their tobacco; thousands smoke it in a pipe or in the form of cigars or cigarettes, while a century ago it was quite a fashionable thing to inhale it in the form of snuff. Now what is it that makes either of these habits so tempting to many men? Well, it is claimed for tobacco that, used in moderation by a full grown man, it soothes the mind. This soothing, deadening, or narcotic effect, as it is called, is caused by the presence in the tobacco leaf of at least two strong poisons, the more important of which is called *Nicotine*, after the French discoverer Nicot, who first introduced tobacco into France. Nicotine is a deadly poison, and even small doses will quickly kill. A single drop of nicotine is sufficient to kill a dog.

(5.) That smoking is comforting and soothing, and may do little or no hurt to full-grown men, who smoke moderately, is probably quite true. That constant smoking—the habit of nearly always having a pipe or cigarette in the mouth—is hurtful, even to the strong and fully grown, seems equally true. It dries the mouth and causes the saliva to flow, and thus lessens the supply needed for

digestion. It produces thirst, and thus encourages drinking. It injures the lining of the stomach, reducing the supply of gastric juice. This is why great smokers commonly suffer from indigestion. It injures the nerves and their important work, as you will learn when you read about the nervous system. In short, while smoking may be comforting and soothing to the nerves, the habit of smoking, if freely indulged, often leads to much weakness and suffering.

(6.) To growing lads smoking is positively harmful. It stunts their growth; it hurts the heart; it is a habit of self-indulgence which grows on boys and leads to other evil habits. It is wasteful; for tobacco in any shape costs money, and makes no useful return. Of all forms of tobacco, perhaps the cigarette is the most hurtful. The smoke of the paper coverings is irritating to the lungs; and tobacco, thus smoked, is probably far more hurtful than a pipe or cigar. Boys, if you want to grow up healthy, tall, strong, and manly, have nothing to do with tobacco, at any rate until you have reached full age. If you would be sound in body and mind, avoid tobacco and strong drink in all their many forms.

nar-co-tic: producing sleep; making insensible.
nic-o-tine: a very poisonous liquid in tobacco.

SUMMARY OF THE LESSON.

The tobacco plant is a native of America. Sir Walter Raleigh first introduced in into England. It requires a hot climate and carefully tended soil to grow to perfection.

Its seeds are sown in August. The leaves are dried, sorted, tied in bundles and pressed. Tobacco is used as cigars, cigarettes, cut tobacco, and snuff. It contains a powerful poison called *nicotine*. Smoking produces thirst and indigestion. It stops the growth, weakens the heart and nerves, and tends to habits of wasteful, harmful self-indulgence.

Lesson XVI.—The Blood and its Wonders.

(1.) YOU have now learned that, as soon as food is digested, it passes into the blood. You have all seen the bright, crimson-coloured liquid which we call blood. In this lesson you will learn what a wonderful thing it is, and how necessary it is to the body. There is no part of the body without it; for the crimson stream of blood is always flowing into every corner. It is a swift stream that never stops, and always flows on in one direction round and round the body. It is a warm stream, and it warms the whole body. Life itself depends upon the blood. If for any reason it should stop *circulating*, that is running its journey round the body, death would take place at once.

(2.) But why is this swiftly running stream so necessary? It is the means by which every part of our body is nourished. The food we eat does not stay in the stomach; you have just learned that, as soon as digestion is finished, the food is absorbed by the inner coatings of the stomach and intestines.

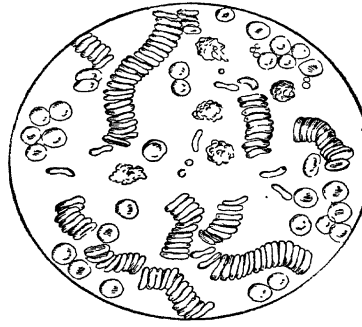
Thousands of small tubes, or blood vessels, pass through these coatings; and the food finds its way into the stream of blood always running through these tubes. As it passes along to every part of the body, bones and flesh, skin and nails take from the blood just what they want for their own use. The blood supplies every part of the body with what enables it to grow, and to make good what has decayed or been worn away.

(3.) The blood is not only *a carrier*, which has something useful to leave behind it wherever it goes: it is also *a sweeper and cleaner*. Wherever it finds any waste materials which the body has done with, it collects them, carries them away, and sweeps them clean out of our bodily house.

(4.) I have told you that the blood is a warm stream. How it gets its heat and keeps always nicely warm, you will learn in another lesson. It is this rapid, constant stream of warm blood, rushing into every nook and corner, which keeps the whole body evenly warm. Clothes do not warm the body: they only prevent its warmth passing into the air. Now you begin to understand why life could not go on without the blood, which nourishes, cleanses, and warms the whole body.

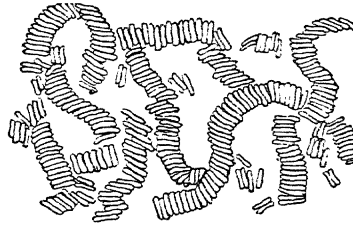
(5.) Would you not like to know something more about the blood? You have all seen it as a bright, red, warm stream, trickling out of a cut or wounded finger. If you could look at a drop of blood through a microscope, you would see that it is really a watery looking liquid, with a vast number of very small particles floating about in it. Most

of these tiny particles, called *cor-pus-cles*, are quite red; they give the blood its bright red colour. If you could next look at a tiny drop of fresh blood magnified by a very powerful microscope, it would



look much like what you see in the diagram. You would see two kinds of corpuscles; the greater number are coloured, and among the coloured ones you would see a few without colour. The red ones are round in shape, like coins, and they cling to each other in rows, like rows of coins. If fresh blood is allowed to stand for a short time it begins to change. You will soon see a reddish jelly, or clot, floating in a clear, watery, yellowish liquid. The clot contains the corpuscles, bound together by fine, delicate threads made of a substance called *fibrin*. It is this fibrin which makes the blood form into a thick clot. When you cut a finger, the

running blood forms a clot, and this plugs up the wound and stops the bleeding.



RED CORPUSCLES.

(6.) The corpuscles are one of the wonders of the blood. The red corpuscles are really *little carriers.* As they travel in the blood all round the body, they carry, not solids, nor liquids, but *gases.* The largest of the red corpuscles is only about $\frac{1}{3000}$th part of an inch in diameter; hence one corpuscle cannot carry much. But there are many millions in only a few drops of blood, so that altogether they can carry a good deal. How important the work of these tiny carriers is to the health of the body, you will learn when you read about the lungs.

(7.) But where is *the food* which goes into the blood? It is all there, although it is invisible. It is dissolved in the watery part of the blood. All the digested food is there, travelling round the body in a steady, ever-flowing stream, ready to stop wherever it is needed to build up and to repair, to warm and to heal.

(8.) Now you see how important the blood is you will better understand one verse in the Bible which says: "Flesh with the life thereof, *which is the blood thereof.*" (Genesis ix. 4.) And you will also understand that we cannot have strong, healthy, well nourished bodies, unless we have healthy blood. Whatever hurts the blood must hurt the whole body. *Alcohol,* whether in beer, cider, wine, or spirits, does no good in the blood. It is *an intruder,* and the blood gets rid of it as fast as it can by sweeping it out of the body through *the skin, the lungs,* and *the kidneys.* But while it is there it does mischief, especially if taken to excess. You will learn later on, how it hinders the useful work which the little carriers, the corpuscles, have to do, and how it hurts the blood in other ways.

(9.) *Tobacco* contains a poison called *nicotine.* When the mouth, throat, and lungs are filled with tobacco smoke, this hurtful poison passes into the blood and can do nothing but mischief there. Those who want their blood to keep pure and healthy should neither drink intoxicating drinks nor smoke. Good, plain, well-cooked food; pure water; fresh air; plenty of out-door exercise; moderation in eating and drinking; the whole body frequently bathed to keep the skin always clean: these are the means of getting and keeping, pure, well-nourished blood, and strong, healthy bodies.

cor-pus-cles, the name given to the very small particles which float in the blood.

mi-cro-scope, an instrument which enables us to see small things distinctly.

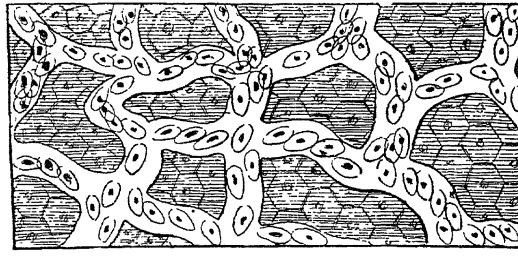
SUMMARY OF THE LESSON.

The blood is *a carrier;* it carries nourishment to every part of the body to make it grow and to repair what is worn away. It is also *a cleanser* and *sweeper*, for it collects and carries away all the waste, used-up materials which would do harm if left in the body. The blood is a warm liquid: hence as it travels round the body, it keeps every part evenly warm. The blood consists of *a watery-looking liquid* and a large number of very small particles called *corpuscles.* Those who want their blood to keep healthy should neither drink intoxicating drinks nor smoke.

Lesson XVII.—The Heart and its Work.

(1.) THE warm, living stream of blood which flows through the body, is not like other streams. The streams and rivers of water flowing through the land do not return to the places where they started. They travel right on until they are lost in some larger river, or some lake, or in the sea. But the stream of blood in our bodies runs round and round, always returning to the place where it started, in order to begin another journey. This is what is meant when we say the blood *cir-cu-lates.* A horse running round a *circus*, constantly returns to its starting place, and then begins another *circuit.* So it is with the blood: it is always *circulating.* People did not always know that the blood circulates: yet there is no doubt about it whatever. The blood of animals circulates too. The skin of a frog's

foot is so transparent that, on looking at it through a good microscope, the blood may be seen rapidly flowing along.

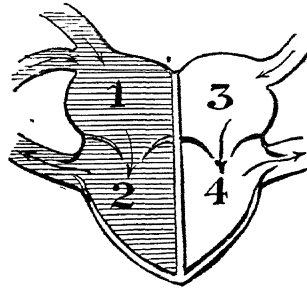


SKIN OF FROG'S FOOT, HIGHLY MAGNIFIED.

(2.) But what makes our blood circulate? And what keeps it circulating, day after day, and hour after hour as long as life lasts? Have you ever seen anybody pumping water? If so, as the pump-handle rose and fell, you saw a steady stream of water running from the spout. There is a strong, active, little pump within each one of us. It is in the very middle of the chest, and is called *the heart.* If you place your hand over the heart, you can feel it doing its work of pumping. Every time the heart rises and falls, or *beats,* as we call it, it pumps a small quantity of blood through the body. This wonderful, little pump is always at work: it will never cease its work of pumping the blood until we die.

(3.) Would you not like to know something about

the heart and its work? Your heart is about as large as your closed fist. What it is like in shape, colour, and substance you can learn very well by looking at a sheep's heart. It is not solid; for it



has four small chambers, two at the top, and two at the bottom. The two top chambers are called *the right auricle* and *the left auricle*: the bottom chambers are called the *right* and *left ventricles*. Now look at the diagram and learn the names and positions of these four chambers.

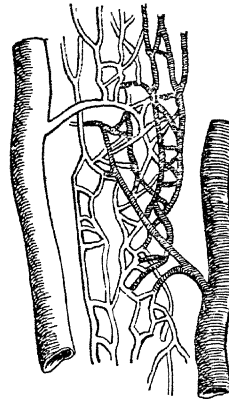
(4.) I want you to imagine, that when you are looking at the diagram, you are looking into a living, beating heart. You will understand that the chambers 1 and 2 on the left of the diagram are on the *right side of the heart*, and that 3 and 4 represent the *left auricle and left ventricle*. If you could really see inside the living heart, you would at once notice a difference between the blood in its right auricle and ventricle (1 and 2) and that

in its left auricle and ventricle (3 and 4). The blood in the right hand chambers is darker in colour than that in the left hand chambers. Why is this? The blood in (1) and (2) has *just come back from a journey through the body;* it is *used-up, impure blood;* and before it can start out for another journey, it must be purified. The brighter, crimson blood in chambers (3) and (4) has been purified, and *has come to the left side of the heart to start on a new journey round the body.*

(5.) Now you are ready to understand how the heart works. Have you ever filled a hollow, india-rubber ball with water, and then made the water flow out by squeezing the ball? If so, you can well understand what goes on in the chambers of the heart. Each of these chambers is like the hollow, elastic ball; for their walls are formed of very elastic material. When the blood has made its journey round the body it enters the right auricle. As soon as the auricle (1) is full, its muscular walls *contract*, that is, *draw together*, and thus squeeze the blood through a little door, or *valve*, which lets it pass into the right ventricle. When the ventricle is full its walls also contract, and pump the blood into the lungs, which lie one on each side of the heart, as you may see in the diagram on page 101. I cannot now explain just what happens in the lungs. For the present you only need know that the blood is there *purified* or made into pure blood. The purified blood returns from the lungs into the left auricle (3); and when the left auricle is full it pumps the blood into the left

ventricle (4). Then the left ventricle contracts; and so the blood, purified in the lungs, starts on another circuit to do its useful work.

(6.) The tubes which carry the blood away from the heart are called *arteries*. The large artery which starts from the left ventricle is a stout elastic tube as thick as your little finger. It soon begins to give off smaller arteries, and these in their turn



SMALL ARTERY and VEIN, and the CAPILLARIES joining them—highly magnified.

give off others smaller and smaller. If an artery is cut, the blood flows out, not in a steady stream, but in little jets, just as you may cause the water to flow in jets from an elastic ball, when you give

it a number of small squeezes instead of one continued squeeze.

(7.) When the blood leaves the smallest arteries, it flows through tubes which are finer than a very fine hair: hence they are called *ca-pil-la-ries* or *hair-like* tubes. The capillaries find their way in great numbers through the substance of the body. It is in the capillaries that the blood does its work, giving up what the body needs from it, and receiving into it the refuse or waste of the body. In this way the pure blood, travelling through the capillaries, becomes impure.

(8.) When the blood passes from the capillaries, it enters very small tubes called *veins*. The smaller veins run together, and form larger and larger veins. It is the veins which carry the impure, used-up blood back again to the right auricle of the heart. The bluish lines which you see in your wrist are veins; for the veins are not so deep in the flesh as the arteries.

cir-cu-lates, moves on and returns to the same place.

cir-cuit, a journey which ends where it began.

ca-pil-la-ries, the smallest blood-vessels: they join the smaller arteries to the smaller veins.

SUMMARY OF THE LESSON.

All the blood in the body circulates, that is, it starts from the heart, goes on its circuit, and returns to the heart to begin its journeyings again. The heart is a pear-shaped organ in the middle of the chest. It has four small chambers, two upper ones called the right and left auricles, and two

below called the right and left ventricles. The right auricle receives the blood when it has made a journey round the body. The right ventricle receives the blood from the right auricle, and forces it into the lungs, where it is purified The purified blood returns to the left auricle, passes into the left ventricle, and is then forced into the great artery to start on another journey. Having passed through the arteries, it enters the capillaries, and then passes through the veins, back to the right side of the heart.

Lesson XVIII.—More about the Heart and its Work.

(1.) THE heart does not always beat in the same way. It may beat faster or slower; its beats may be stronger or weaker; and they may follow each other regularly or irregularly. This is why the doctor always places his fingers on the pulse of his patient. The pulse tells him how the heart is doing its work. If the pulse is too fast or too slow, or if its beats are not perfectly regular, or if they are feebler than they ought to be, he knows there is something wrong with the body.

(2.) Have you ever thought what a hard worker the heart is? Your heart beats about 80 times a minute; but no doubt you have noticed that it beats faster than usual when you have been running, or when anything has suddenly frightened you. If it beats 80 times a minute it must beat nearly 5,000 times an hour, and nearly 116,000 times in a day of 24 hours. The heart pumps two ounces of

blood at each beat. If you can work out the sum you will find this amounts to above 6 tons of blood coming each day to the heart to be pumped into the lungs and through the body. No wonder the heart must beat without ceasing when it has such a heavy daily task to get through!

(3.) "But why does it beat at all?" "And why does it take no rest?" Perhaps you would like these questions answered. *We* have little to do with its beating. It goes on when we are asleep just as well as when we are awake. In a later lesson you will learn about the fine silvery threads, or *nerves*, which run through every part of the body, just as the veins and arteries do. It is the nerves going to the heart which make its walls contract. Other nerves regulate its movements, so that it may beat neither too slow nor too fast. The answer to the second question is not so difficult. *The heart does rest*, but *it only gets very short rests.* It gets a short rest between each two beats; and a large number of short rests have to do instead of one long rest, such as our limbs get when we are asleep. Would it not be unwise to make this hard working little organ, work faster than it needs? And would it not be cruel to deprive it of any of its well earned rest? Yet many do these things every day. Then after a time their hearts will not do their work properly, and the whole body suffers.

(4.) Have you ever felt *faint?* Or have you ever seen a person fall in a *fainting fit?* This happens when, for a moment or two, the heart loses its strength, and cannot pump the blood as

strongly as usual. Then the person feels giddy and weak, and he falls. The best thing to do is to lay him flat upon his back. He has fainted because the weak heart cannot pump the blood up to his brain fast enough: when he is lying down it can do this more easily. If the face is sprinkled with cold water, the shock will help the heart to begin beating more strongly.

(5.) We cannot hope to grow up strong and healthy unless the blood is healthy. And we also need a strong healthy heart to propel the blood on its circuit round the body. How can we get pure healthy blood? This question was answered in *Lesson XVI.*, but the answer is worth repeating. *First:* We must *eat only good wholesome food.* We must *not eat too much even of good food,* or the blood gets more nourishment than it knows what to do with. *Second:* We can only have healthy blood by *breathing fresh air*, and by *keeping our bodies perfectly clean* with frequent washing and bathing. You will soon learn what fresh, pure air has to do with pure blood. Many of the impurities of the blood are given off through the pores of the skin; and the pores can only be kept open and clean, by regular and frequent use of soap and water. *Third: Plenty of bodily exercise is necessary.* It helps the circulation; it helps the blood to get rid of its waste materials through the pores of the skin. *Fourth: Have nothing to do either with Alcohol or Tobacco.* Both hurt the blood; and, if used to excess, they do much injury to the heart. The mischief which Alcohol and Tobacco do to the

blood has already been explained in *Lesson XVI.* You have now to learn the harm they do both to the heart and to the circulation.

(6.) All strong drinks have an effect on the heart. As soon as they are taken, they make it *beat quicker than before.* If it beats faster, its short periods of rest become shorter still. Thus the heart becomes *over-worked and wearied.* But when anybody becomes over-worked, he cannot do his work as well as it ought to be done. It is the same with the heart. Alcohol makes the heart beat faster; but *its beats are not so strong*, and they do not drive the blood along as well as before. You can easily understand, too, that when a thing is over-worked it is likely to get out of order; it is said that the heart often gets out of order and diseased through strong drink. There is yet another way in which those who take a good deal of strong drink often do the heart much harm. You know that the heart is made of *muscle*, and that it is its walls of muscle which make it so strong. Sometimes fat begins to take the place of the muscular substance of the heart; then the heart is not strong enough to do its work properly. Such a heart sometimes stops suddenly, and life ends. Perhaps there is nothing so likely as alcohol to cause what is known as *a fatty heart*, especially in the case of great drinkers.

(7.) Tobacco is another thing which works much mischief to the heart and the circulation. The healthy heart beats as regularly as the pendulum of a good clock Tobacco causes the heart to beat

irregularly. It deadens the nerves which control the beating of the heart, and makes it beat too fast as well as irregularly. A doctor has no difficulty in telling whether a boy is given to cigarette smoking. He has only to try his pulse; the unsteady, hurried, weak beats tell him at once of the bad habit the lad is following. All who want to grow up with perfect health must avoid strong drink and tobacco, and especially tobacco made into *cigarettes.*

SUMMARY OF THE LESSON.

A child's heart beats about 80 times a minute, nearly 5,000 times an hour, or 116,000 times a day. The heart gets short periods of rest between the beats. Certain nerves cause the heart to beat; other nerves regulate the beats. Alcohol and tobacco both interfere with the working of these nerves. They deaden the nerves which regulate how fast the heart must beat; and they make it beat faster and less steadily. They also deaden the nerves which keep it beating, so that its beats are feebler. When used to excess, alcohol and tobacco may cause serious disease of the heart.

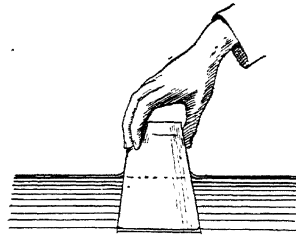
Lesson XIX.—The Wonders of the Air we Breathe.

(1.) YOU have learned a good deal about food and drink, but breathing is as necessary to life as eating and drinking. We might live for some days without food or drink, but, if our supplies of air were suddenly cut off, we should die in a few minutes.

(2.) It has been often said that there are two oceans round our world. There is *the ocean of water* which covers about three-fourths of its surface, and there is *the invisible ocean of air* which covers it everywhere. The ocean of water has a depth of about seven miles in its deepest parts: the air ocean has a depth probably not less than one hundred miles. When we go to the seaside and look out upon the waters, we see the upper surface of the ocean of water. But we live at the bottom of the ocean of air, and move about with the whole body of air above us. Just as fishes swim and float in the ocean of water, so birds and insects swim and float in the ocean of air.

(3.) What is this air, which covers the whole earth like a close fitting garment, and penetrates every nook and corner of its surface? It is a *substance* just as much as water is a substance. It can be *felt* when we fan ourselves; and when it is moving we feel that it touches our faces. *It has weight;* a vessel full of air, is always found to weigh more, than it does when the air, has been pumped out of it by means of an air-pump. Though air is an invisible, transparent substance, *it is very elastic.* There is a simple experiment which you can try for yourselves to prove how elastic it is. Press a tumbler with its mouth downwards under water. You will notice that the water does not rise and fill the tumbler, for it is kept out by the air within. But the air in the tumbler is now squeezed into a much smaller compass than it was before. Remove gradually the hand which is press-

ing down the tumbler, and notice how the tumbler at once springs upwards. The confined air within it, is like an elastic spring that has been compressed, and returns to its proper size when the pressure is removed. Air can be compressed into a very small compass; but it at once expands when the pressure is removed. This is what we mean when we say air is very elastic.



(4.) But what is this invisible, transparent, elastic substance which we call air? It is one of those bodies which we call *gases*. The invisible substance which so easily burns when we turn on the gas and put a light to the burner, is another kind of gas, called *coal-gas*. The air we breathe does not consist of one kind of gas, but of several kinds, as you will learn in the next lesson.

(5.) It would require many lessons to teach all the wonders of this beautiful garment of air, with

which God has clothed both sea and dry land. Perhaps you will best understand how much we owe to it, if I try to show you what would happen, were the whole ocean of air suddenly to disappear. Everything living on the earth would die. Neither beast nor bird, reptile nor insect could live without the air they all breathe. All trees and plants, the green grass, the moss that makes many a stone and rock look beautiful, the flowers with their beautiful forms and varying colours, would all die. For all plants breathe air; none can live without it.

(6.) Not a fire would burn; not a furnace would glow with heat; not a candle or lamp could be lit. Without air, inflammable things would not take fire, neither would fuel burn. Without air we should hear nothing; the whole world would be perfectly silent. The thunder crash and the storm waves dashing on the seashore would produce no sound. We hear, by means of the sound-waves which the sounding body makes in the air. But if there were no *atmosphere*, as the whole body of air is called, there could be no sound waves, and nothing could be heard.

(7.) There would be neither mist nor cloud; neither shower of rain nor hail, nor falls of snow. These things, so useful, so beautiful, so varied, are all caused by the water-vapour in the air. But if there were no air to hold the water-vapour, the vapour would pass away into empty space and never return in the shape of dew-drops, rain-drops, hail, or snow. Probably the sea itself would gradually lose all its waters, and the

earth would become a waterless desert, like the moon is supposed to be.

(8.) How pleasant it is to have the twilight when the sun goes down! How gently darkness then creeps upon us! And how pleasantly the dawn begins and the light gradually increases until we have the full blaze of the rising sun! If we had no atmosphere we should have neither evening twilight nor morning dawn. The full blaze of the setting sun would instantly be followed by midnight darkness; and midnight darkness would instantly give place to blinding sunlight at the sun's daily rising.

(9.) Let us never forget to Whom we owe our abundant supplies of life-giving fresh air. There is enough for all and to spare; it is free to all; the poorest have it at their command; it is like all God's very best gifts to us: it is "*without money and without price.*"

in-vis-i-ble, not able to be seen.

in-flam-ma-ble, able to be set on fire easily.

vary-ing, changing.

at-mos-phere, the air.

SUMMARY OF THE LESSON.

Air is the invisible transparent substance which everywhere covers the earth. Like all substances, it has weight. It belongs to that class of very light and elastic substances which we call gases. It is made up of several different kinds of gases. Without air, no living creature could continue to live; no sound could be heard; no fire nor candle would burn. If there were no atmosphere, we should have neither mist, cloud, rain, hail, nor snow; neither should we have twilight or dawn.

Lesson XX.—The Worth of Fresh Air.

(1.) TO-DAY'S lesson is about pure air, or *fresh air* as we often call it. There is nothing which the body needs more than a constant supply of pure air: we cannot be perfectly healthy without it. Many people are sickly because they breathe air which is far from being pure. Perfectly pure air always contains four different gases. It contains *oxygen*—a busy-body gas which lets nothing alone; *nitrogen*—a quiet, inoffensive gas which does not meddle; some *water-vapour*, and a very small quantity of a heavy, poisonous gas, known as *carbonic acid gas.* Of the last two gases—the water-vapour and the carbonic acid gas—there are such small quantities, that we may almost say pure air consists of oxygen and nitrogen. One hundred pints of pure air contain about twenty-one pints of oxygen and seventy-nine pints of nitrogen.

(2.) We can hardly expect to find perfectly pure air in towns. Think of the smoke, the dust, the dirt which get into the air and float about in it. Think of the badly-smelling gases given off, by decaying things, and in many trades. If we want air which is quite pure, we shall be more likely to find it in the fields than in towns; we should certainly find it on mountain tops and on the broad, deep sea.

(3.) If one of you was placed in a room full of air quite fresh and pure, the air would remain

fresh and pure only for a very short time. You would be obliged to go on breathing: you would breathe about twenty-five times a minute, and *at each breath you would spoil some of the fresh air.* Is it not very plain, then, that when several people are in a room, the air cannot keep pure unless fresh air from the outside is constantly entering? And is it not a fact, that when we are quietly breathing in our sleep, fresh air must be allowed to enter the whole time or else we must breathe spoiled air?

(4.) The next question to be answered is "*How does breathing spoil the air?*" When we breathe, we do two things: we first draw in air and then breathe it out. But the breathed-out air, or *expired air*, is very different from what it was when we drew it in, or *inspired* it. It differs in two ways. The air breathed out has less oxygen than the fresh air, and it has much more of the poisonous gas which you have learned to call carbonic-acid gas. It is these two changes which have turned the fresh, inspired air into bad air.

(5.) Let us now learn where and when, these changes take place. When we breathe, we draw in air through the nose and mouth into the throat. At the front of the throat you may feel a pipe called the *wind-pipe*. It is so called because the air passes up and down it as we breathe. The air goes down the wind-pipe into two, soft, spongy organs called the right lung and the left lung, as you may see in the diagram on page 103.

(6.) Have you ever exchanged things with a friend or play-fellow? *What takes place in our*

lungs when we breathe, is only an exchange. The spoiled blood which is pumped into the lungs from the right side of the heart, is full of poisonous carbonic-acid gas, and wants to get rid of it. It also needs a fresh supply of oxygen to make it good, useful blood once more. When it gets into the lungs it meets the air and at once makes an exchange with it, taking from it the useful oxygen and giving up the hurtful carbonic acid. You ought now to understand why the air we expire is very different from pure air. Expired air is unfit to breathe again, because it has not enough of the oxygen which the body needs; and because it contains a dangerous amount of gas which is poisonous. It is easy to prove that we breathe out carbonic acid gas. We have only to get some lime-water from the chemist's and breathe into it through a pipe: you will see the colourless, transparent lime-water quickly turn white and milky. Now nothing except carbonic-acid gas can turn lime-water milky, so that we have a clear proof that this gas is expired with our breath.

(7.) There are other ways of spoiling fresh air besides breathing it. A fire, a burning gas jet, a burning candle or oil lamp, soon make air impure, because they do to it exactly what breathing does. They take oxygen, for they cannot burn without it; and they all add to the air the harmful carbonic acid gas. An ordinary gas burner spoils as much air as three or four people. No wonder the air in rooms containing many people, and a number of burning jets of gas, soon gets unfit to breathe,

unless there are open windows or other means of supplying fresh air!

(8.) What harm does impure air do? If very impure, *it may even kill.* Have you never heard the dreadful story of the Black Hole of Calcutta, where 146 poor prisoners were made to spend a hot summer's night in a dark room, and only 23 were found alive next morning? The rest were suffocated, that is, died from want of fresh air. If not nearly impure enough to cause suffocation, bad air will do much harm, especially if it be breathed often. The blood, instead of being pure, becomes clogged with waste materials. The head aches; we begin to feel languid and stupid; the cheeks get pale, the eyes lose their brightness; everything shows the body is getting out of order. Living and working in bad air is one of the surest ways of losing health. It is worth printing in large capital letters and placing in every dwelling, workshop and meeting room that—

A CONSTANT SUPPLY
OF FRESH, PURE AIR
IS
NECESSARY FOR HEALTH.

(9.) When poor people live in small rooms built in narrow lanes and alleys, it is very hard for them

to breathe anything but impure air. Those who live in the country never need breathe impure air. But many of them do breathe it. In summer they often stop up their chimneys, and thus deprive themselves of one means of ventilating their rooms. In winter they keep their windows closed lest cold air should enter. They often forget to throw open the bed room windows in the morning, so that the pure air from the outside may enter and sweep out the foul air within. Their houses are sometimes stuffy and close. They too often forget the wise old adage which says : " *Where fresh air cannot enter, the doctor must.*"

ox-y-gen,
ni-tro-gen, } gases present in the air.

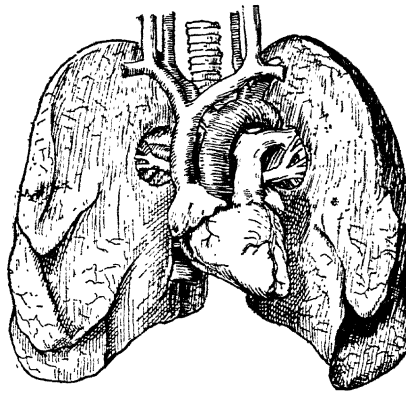
suf-fo-ca-tion, choking.

ven-ti-la-tion, replacing foul air with pure air

SUMMARY OF THE LESSON.

We need a constant supply of pure air. Pure air contains oxygen, nitrogen, water vapour, and carbonic acid gas. The air we breathe out is not fit to breathe again, because it has far too much carbonic acid gas and too little oxygen. This is why the air in the rooms where we live, work, and sleep, needs to be constantly changed. When we inspire, or breathe in air, it passes into the lungs. There an important exchange takes place between the air and the blood. The blood gives up carbonic acid gas to the air and receives oxygen from it.

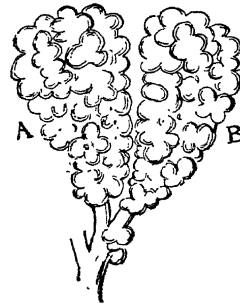
Lesson XXI.—The Lungs and Breathing.



(1.) YOU have learned that, when the blood leaves the right ventricle of the heart and goes to the lungs, it goes there to be purified. In this lesson you will learn more about the lungs and what takes place in them. The two lungs, as you know, are in the chest; the larger lung to the right of the heart is called the *right lung*, the smaller lung the *left lung*, is on the left side of the heart. You must all have seen the pinkish, smooth, shining lungs of a sheep: our lungs are very like them in size and appearance. The lungs look as if they

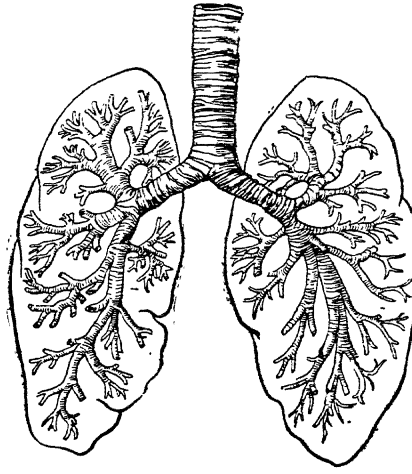
were solid; but, as perhaps you know, they are very spongy and very elastic.

(2.) Each of the lungs is packed full of very small rooms, or cells, arranged in groups or clusters. Each cluster is called *a lung-sac.* The lung-sacs are very small; forty of them would barely measure an inch if they stood side by side in a straight line. The diagram shows you two clusters,



A and B, very much magnified. You will notice that each cluster of lung-sacs has a little tube to supply it with air. All these little tubes receive air from the wind-pipe. If you examine the next diagram you will see how the wind-pipe divides into two branches. These branches again divide and sub-divide, until they reach the tiny tubes which supply air to the air-sacs. All these tubes are called bronchial tubes; there is one small bronchial tube for every cluster of lung-sacs.

(3.) The walls which enclose these tiny sacs or cells are very thin, as you may suppose. Yet it is in these delicate, thin walls that the important work of the lungs is done. You read in the last lesson about the exchange which goes on in the lungs



between the pure air which we inhale and the impure blood which is pumped into the lungs. *Where does the pure air meet the impure blood? In the thin membranes which form the air-cells.* These membranes are full of the very fine thin, air-like

tubes, or *capillaries*, containing the impure blood brought to the lungs. Every time we breathe, oxygen passes out of the lung-sacs into the capillaries, and carbonic-acid gas passes out of the capillaries into the lung-sacs. The blood comes to the lung-sacs dark in colour; when it goes away it has changed to a bright red. It is the oxygen received, which makes this change. The red corpuscles have become dark because they are carrying back carbonic acid to the lungs. When they get there, they give up the hurtful carbonic acid and absorb oxygen. Then they are of a bright red colour once more. Without any effort of our own we go on breathing, whether we are asleep or awake: and at each breath the blood is purified and freshened by receiving oxygen and giving up its refuse. Another lesson will teach you what becomes of the oxygen, and why the blood is always giving off carbonic-acid gas.

(4.) The lungs are what we call *vital organs*, that is, organs on which life itself depends. Their substance is so delicate, and the work they have to do so important, that we should do everything we can to protect and help them; and avoid everything likely either to hurt them, or to hinder their useful and constant work. Lung diseases are very common in our own land and in many other lands. *Consumption*, a very common and very fatal disease, carries off thousands yearly. It is a disease which destroys the delicate substance of the lungs. Bad air, damp feet, frequent and severe colds, lack of warm clothing, are some of the common causes

which lead to this deadly disease. As you will learn further on, the unwise use of strong drinks and tobacco also accounts for lung disease. *Bronchitis* is a very common disease which kills many, both young and old. It is an inflammation in the tubes which supply air to the lungs. The tubes become choked with *mucous*, and the patient is in danger of suffocation, because the stopped tubes prevent him breathing. *Asthma* is another disease in the bronchial tubes which makes breathing very difficult and painful.

(5.) What can we do to protect the lungs and help them to keep in perfect health? Whatever helps to strengthen the whole body and make it strong will be good for the lungs. Regular habits; sufficient, but not too much, good plain food; plenty of out-of-door exercise; perfect cleanliness of body and clothes; all these are necessary. We must do all we can to avoid *colds*. A cold is the result of some part of the body becoming *chilled*, through exposure to cold, damp air, or going about in wet clothes; or it may arise from damp feet, or from scanty clothing. A chill is the usual beginning of the diseases which attack the lungs. In cold weather, the body, and especially the back and chest, need to be well protected with woollen clothing. Nothing is more likely to preserve you from colds and lung troubles than plenty of daily exercise in the open-air. This quickens the circulation and drives the blood to the surface of the body, so that it is not so likely to get chilled. It also helps us to breathe with those strong, deep breaths

which best supply the body with oxygen and remove the waste carbonic-acid gas.

(6.) *Tobacco* is certainly hurtful to the lungs. It makes the air around impure. It irritates the throat and air-tubes, making them more liable to take cold. It hurts the substance of the lungs; the nicotine or poison it contains finds its way into the blood. All doctors are agreed that the use of tobacco, and *especially cigarettes*, is hurtful in many ways to young people. They are the wiser who never begin to learn to smoke.

(7.) *Alcohol* in every form is hurtful to the lungs and their work. You will learn in another lesson that nobody is so likely to take a chill through exposure to damp, cold weather, as those who drink much beer, wine, or spirits. Alcohol weakens the lungs and gives them more work to do. It passes into the blood and does much mischief there. It prevents the corpuscles taking in as much oxygen and parting with as much refuse as they ought to do, when in the lungs. The lungs do their best to get rid of alcohol. They show they do not want it by breathing it out. The breath of a person who has been drinking always smells of alcohol.

asth-ma, a disease in the small air-tubes which makes the breath short.

con-sump-tion, means *wasting*.

bron-chi-al tubes, the tubes in the lungs.

bron-chi-tis, inflammation in the bronchial tubes.

SUMMARY OF THE LESSON.

There are two lungs, the right lung and left lung, one on each side of the heart. Each lung is made up of large numbers of clusters of small cells called *lung-sacs*. Every lung-sac is supplied with air from the wind-pipe by means of small tubes called bronchial tubes. It is the thin walls of the air-cells that form the meeting place, for the impure blood, which the heart pumps into the lungs, and for the pure air which we inhale. It is there, that the air gives up part of its oxygen to the blood and receives part of the waste materials in the blood. The substance of the lungs is delicate and liable to disease. Breathing bad air and the intemperate use of strong drink and tobacco, are very hurtful to the lungs and their work.

Lesson XXII.—Ventilation, and How to Get It.

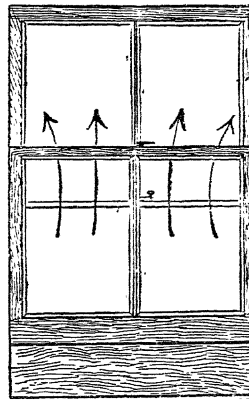
(1.) WHAT is ven-ti-la-tion? Ventilation is a change of the air in our rooms. As you know, the air in a room with people in it soon begins to get foul. If the foul air is constantly driven out by fresh air let in from the outside, we say the room is *well ventilated*. The best way of testing whether a room is well ventilated is to go into the open air for a few minutes and then re-enter the room. If you notice a close, stuffy smell, you may be sure the air in the room is not pure. People who live in the country, where pure, fresh air surrounds them on all sides, are not always careful to see that their houses are well ventilated. They seem to think that because they are much out of

doors, where the air is pure, they need not trouble about ventilation. Perhaps this is why bronchitis and consumption are common in the country, as well as in the crowded, narrow streets of great cities.

(2.) When Mr. Price's house was built, nobody troubled much about its ventilation. The windows were too small; and they were not placed high enough up the walls to let out the bad air; for bad air always rises. Some of the windows only opened at the bottom, and some were not made to open at all. Fortunately, the kitchen and sitting-room were both large. But the bedrooms were small; and the windows only opened at the bottom.

(3.) It was during the first winter, when poor Dick had to keep his bed, that his parents found out the need for better ventilation. Mr. Watson, the village doctor, complained that the air in Dick's room was stuffy and unwholesome; but his mother was afraid to open the window lest the sick boy should take cold from the draught. One day Dr. Watson tried to open the one small window and found that it only opened at the bottom. He at once saw Mr. Price and told him that Dick's room must be better ventilated. "It can be done very easily, and without much expense," said the doctor. "If the window is to ventilate well it must open both top and bottom. It must open at the top to let out the foul air; and it must open at the bottom to let in fresh air." As soon as the doctor was gone, Mr. Price fetched in his neighbour, the village carpenter, and, without much trouble, the upper sash was altered so that it could be lowered to let out

the bad air at the top. They could now open Dick's window both top and bottom, but there was still a strong draught through the bottom opening. The carpenter said he knew an easy way to stop the draught without stopping the ventilation. He screwed a strip of board close to the open space left



by raising the lower sash. But where would the air get in? Between the upper and lower sashes, as the diagram will show you. Even when the weather is too bad to let down the upper sash, the lower one can be raised so as to ventilate between the sashes.

(4.) There were other badly ventilated rooms in the house beside Dick's bed-room. Mr. Price would have liked to take out all the other window-frames, so that larger and better ones, opening both top and bottom, might be put in. But this would have been a heavy expense ; and on the doctor's advice, he got the glazier to put a ventilating pane as high as possible in each window.

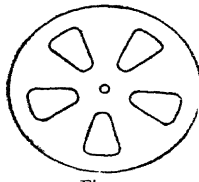


Fig. 1.

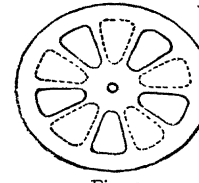


Fig. 2.

The ventilating pane had five good-sized holes in it, as you see in the first sketch. A circular piece of glass, containing five holes of the same size and shape, fitted closely over them. By turning this circular disc, the holes could be closed, left partly open, or left wide open. The second sketch shows the panes with the ventilating holes closed. You can see that the five holes in the disc do not cover the holes in the pane underneath.

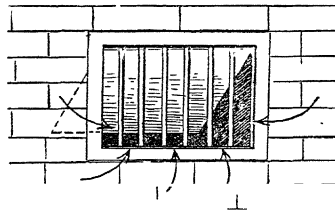
(5.) When Mrs. Price saw the trouble and expense her husband was put to on purpose to secure good ventilation, she determined to do what she could to keep the air in the rooms always fresh and wholesome. Instead of stopping up the chimneys

in summer time to prevent the rain and wind blowing down the soot, she determined to leave them open. She was quite right: *open chimneys are the best ventilators a room can have.* She was also very careful to see that the windows and doors of the bed-rooms were thrown wide open during the day, so that they might be thoroughly flushed out with fresh air. She also took care that the bedding was thrown open every morning, so that sheets, blankets, and counter-panes might be well-aired before the bed was made. She also took care that the bed-room windows should be *always left open a little at the top, even during the night.* Dr. Watson had told her there would be no fear of taking cold, even in frosty weather; and that the top sash must always be left down, if only an inch, or the air in the bed-rooms could not remain pure.

(6.) There was always a good fire in the kitchen, and thus there was no difficulty in keeping it well ventilated. The fire in the open fire-place always warmed the air in the kitchen. Cold air is heavier than warm air. Hence the colder and heavier air outside found its way into the kitchen and forced the warm and lighter air to rise. This is why there is such a strong draught up a chimney. The draught carries much of the impure air with it into the chimney, which is a capital ventilator.

(7.) One cold winter's evening, when all the family were occupied in different ways, some at work, and some at play, Mr. Price stood on a table in order to fix a nail high in the wall. He was surprised to find how hot and stuffy the air

was near the ceiling. This taught him that the chimney did not sufficiently ventilate the kitchen when the room was closed. The next time he sent to town for ironmongery, he ordered *a*



CHIMNEY-VALVE.

chimney-valve. This is a small iron-box let into the chimney near the ceiling. There is a close-fitting, light door hanging at the front of the little box. When it was fixed in the chimney the top of the room was well ventilated. Every time the kitchen door opened and fresh air came in, the pressure of the air opened the door of the chimney valve, and some of the foul hot air near the ceiling was drawn into the chimney. If at any time there happened to be a down draught in the chimney, it blew behind the small hanging-door of the valve, and shut it so closely that no smoke could enter the room.

disc, a flat, round plate.

valve, a door opening one way.

flushed, flooded, well washed out.

SUMMARY OF THE LESSON.

Ventilation is the exchange between the pure, outside air, and the impure air in a room. A well ventilated room never smells close and unpleasant. The windows and doors should be thrown open as often as possible to flush out the rooms with fresh air. The top sashes of windows should be made to open; and the bottom sash ought to be made so that it can be raised without admitting a dangerous draught. Ventilating panes are useful at the tops of windows. The open fire place and chimney are an excellent means of ventilation; and a chimney valve is useful.

Lesson XXIII.—How our Bodies are kept Warm.

(1.) IT was a keen, frosty afternoon in January when, coming in from school, Harry Price and his sisters found poor, feeble Dick, the cripple, huddled up in his arm-chair before the blazing kitchen fire. "Come and warm your hands before having tea," cried their mother, "I am sure you must need it on this wintry day." "Not I, mother," said Harry. "Nor I," chimed in Jane and Sarah with one voice, "We have been having a good game on our way home;" and their rosy cheeks and sparkling eyes certainly told the same story. "How jolly!" said poor Dick with a sigh. "In spite of my warm clothes, and this thick, woollen shawl round my shoulders, I cannot keep warm." "And I really do not know what else to give him to make him feel warmer," added Mrs. Price. "In our lesson

at school this afternoon," said Sarah, "Mr. Francis told us that clothes do not warm us at all, and that all our warmth comes to us either from the sun or from our own bodies." "Yes," continued Harry, "and he said that our bodies were like furnaces, and that the food we eat is the fuel which they burn."

(2.) "Then Dick ought not to feel so cold, for he ate a good dinner for him," said his mother. "Since this cold weather set in, he certainly has had a better appetite." "Yes," broke in the blacksmith, who had not yet joined in their conversation, "but plenty of food is not all we need to warm us. I should be able to do very little work at my forge without my bellows to make the fire burn brightly; and without plenty of exercise in the fresh air, our bodily fires burn dull and dead. Air enters them every time we take a breath; but exercise makes us breathe more rapidly and vigorously, and thus brings an extra supply of oxygen to the bodily furnace, causing a warmer glow, in much the same way as the working of my bellows causes an increase of heat at the forge."

(3.) "That is all very well," said Mrs. Price, "but what is the use of good clothing, if food and exercise are all we require to keep us warm. And why do we wear thicker clothing in winter? I should be very sorry," she added, "to go to the North Pole in my summer dress." This remark made her husband smile as he replied, "I was reading the other day an account of an Esquimaux hut. The Esquimaux as you know live not very far from the

North Pole, in a land of ice and snow, where for three months in the year neither daylight nor sunshine are seen. So cold is it that not a blade of grass or evergreen leaf can grow. The inhabitants of these regions build for themselves dome-shaped huts of large stones, filled in with moss, and covered with blocks of ice and frozen snow. There are no windows, and only the smallest possible door in the

thick, frozen walls of these odd dwellings. On entering you would find yourselves in a very small, and terribly close room. There is no fire, and the only visible source of light and heat is a smoky, evil-smelling lamp, fed with seal oil. The ten or a dozen people who live there, wear scarcely any clothing, and yet, marvellous to relate, instead of being frozen to death, they are actually perspiring with the

heat. This heat is produced entirely by the slow combustion of food materials in the bodies of the men themselves. When they go out of doors, these very same men wrap themselves up in the thickest possible clothing of skins and furs. How is it then, Mother," asked Mr. Price, "that they keep so warm without clothing, in their fireless, snow built houses?"

(4.) "I can still hardly believe that it is true," replied his wife, "but it must be that the thick walls of the hut shield them from the cold." "Rather," said the blacksmith, "that the walls prevent the heat from passing away from their bodies. The warmth of their bodies first of all heats the small amount of air between them and the walls of the hut, and then finds great difficulty in getting any further. Their bodily heat is kept up by the large amount of food, particularly fat food, which they eat. People in those cold countries always have a good appetite, just as it is one of Nature's laws that we at home have better appetites in the cold weather. When the Esquimaux leave their houses, they clothe themselves with the furs which the Creator has bestowed upon the animals living near them. These serve exactly the same purpose of keeping the bodily heat from escaping; and in the same way when winter comes in, we put on thicker clothing."

(5.) "I cannot yet understand," said Dick, "how there can be burning going on in our bodies." "That is because you think there must always be flame and very much heat when there is burning," said Mr. Price. "Have you never seen a piece of paper or linen scorched and burnt away

without it actually bursting into flame? *Nothing will burn without oxygen.* If there is much oxygen supplied to the fuel, it burns fiercely and with a bright flame; if little oxygen is supplied, then it burns much slower, and possibly without any flame. When the bellows are not blowing air into my fire, it almost goes out. When I blow in air, the oxygen of the air *changes the coal into other substances*, and we call this change *burning* or *com-bus-tion.* When burning is going on there is always heat; but if the burning is very slow there will be neither light nor flame. The oxygen, as soon as it gets into the air-cells which make up the lungs, passes into the capillaries, where the blood is. It at once begins to burn up the food, which you will remember finds its way into the blood. But this internal burning goes on so slowly that it causes neither light nor flame. It is not easy, perhaps, to understand, but it is certainly true that the body is kept warm by the burning which goes on within it."

in-ter-nal, that which is within.

mar-vel-lous, wonderful.

SUMMARY OF THE LESSON.

Clothes do not warm the body. The body is a stove or furnace, and the food we eat is the fuel which is burned in it. Exercise causes the bodily fire to burn quicker by making us breathe quicker, so that the lungs get oxygen faster. The oxygen changes the food dissolved in the blood. The change gives off heat, and is called burning. Thick clothes do not make the body warm; but they prevent the heat of the body passing away quickly.

Lesson XXIV.—The Worst Way of Warming the Body.

(1.) ONE of the commonest mistakes people make about strong drinks is that they warm the body when it is cold. Some think and say that the quickest and best way to make the body warm is to take a glass of spirits; and spirits, as you know, contain about equal parts of water and alcohol. Now if this were true, it might be a good reason for taking strong drinks. As you have already learned, bodily warmth is obtained from the food that is burnt up in the body itself; and if alcohol gives warmth to the body, then it must be a heat-giving food.

(2.) Those who are accustomed to take strong drinks will tell you that as soon as they have drunk their dram of spirits they feel warm inside, and that the warmth seems to pass through the whole body from head to foot. This is perfectly true. Strong drinks, especially spirits, do at first impart a comfortable sensation of warmth. But no fact is capable of surer proof than that the effect of alcohol is *to diminish and not increase the heat of the body.*

(3.) You have already read about, and perhaps have seen, the tell-tale *thermometer* which the doctor carries in his pocket. By placing the end of the thermometer in the mouth, or under the arm-pits, and leaving it there a few minutes, the

temperature of the body can be correctly measured at any moment. The temperature of the body in health always remains at about 98 degrees (98) of the common thermometer. If a small quantity of spirits be drunk, not only does the drinker feel warmer in a little time, but he looks warmer. His face gets red and flushed, and if his temperature be carefully taken, it will be found to have risen—sometimes half a degree, sometimes a whole degree, and sometimes as much as a degree and a half. It therefore seems as though the alcohol taken had actually made the body warmer. But presently the reddish flush on the skin, and the feeling of warmth pass away. If the temperature be now tested *it will be found to be from half a degree to a degree lower than it was before the spirits were taken.* This low temperature will last for an hour or two, and often longer. Does not this show clearly, that, while alcohol raises the heat of the body for a brief space of time, its final effect is to make it colder?

(4.) The experience of all sailors in the Arctic regions, of soldiers on the march in winter time, and of travellers who have been long exposed to wet and cold weather, is that they can keep warmer without strong drinks than with them. It has been very often proved that it is most dangerous to give alcohol in any shape to men who have to endure extreme cold. Those who go on exploring expeditions towards the North Pole abstain from alcohol, even if they do not abstain at other times. Again and again it has happened that soldiers, marching

long distances in severe weather without taking strong drink, have successfully resisted cold and exposure, when those taking the drink have broken down. What a mistake unthinking people make, who give a cabman a glass of spirits to keep him warm on a winterly night! If they would only give him a slice of bread thickly buttered and a cup of hot cocoa, these heat-giving foods would be a real help. Alcohol in any form only warms and cheers for a short time; afterwards the body is much colder than before.

(5.) "But why does alcohol *seem* to warm the body? And why does the thermometer register a higher temperature after strong drink has just been taken? And how is it that it warms the body at first?" These are very proper questions, and it is not difficult to answer them. Alcohol does not really give additional warmth: *it only drives much of the heat within the body to its outward surfaces.* Hence the skin is flushed and feels warm; but this heat which is forced to the surface soon passes into the air; and, as the body thus loses some of its heat, it is colder than before. It is not easy for you to understand *how* alcohol drives the heat of the body outwards, until you have learned about the nerves and their work, and how alcohol affects them. But you know that the blood is conveyed from the left ventricle of the heart, outwards towards the surface of the body, by arteries which get smaller and smaller as they divide and sub-divide into many branches. Alcohol relaxes the small arteries, so that the heart more readily forces its warm blood

through them. Hence they become very full of warm blood, which flushes the skin and gives the sensation of warmth

(6.) What you have learned shows that alcohol not only does not add warmth to the body, but also lessens its power of enduring cold. Neither does it help the body to endure extreme heat. Soldiers on the march under the tropical sun of India and Africa, iron workers, glass blowers, labourers in gas works, and stokers in the great steamships, all find that they can endure the excessive heat to which they are exposed much better without alcohol than with it. Both for endurance in hard work and under extremes of temperature, the total abstainer is undoubtedly the better off.

sen-sa-tion, a feeling in some part of the body.

di-min-ish, to make smaller.

tem-per-a-ture, the degree of heat.

re-lax-es, loosens, opens.

SUMMARY OF THE LESSON.

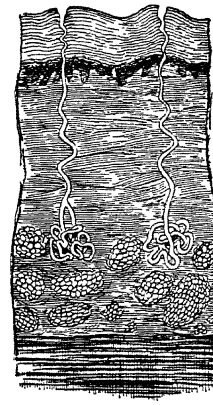
Alcohol seems to raise the temperature of the body and to fortify it against cold. It certainly raises the temperature at the surface for a short time, and gives a pleasant feeling of warmth, but the temperature soon falls below its proper standard, and chill and depression follow. Alcohol neither warms the body, helps it to endure cold, nor to endure extreme heat.

Lesson XXV.—The Covering of the Body.

(1.) YOU have read many things about the inner parts of the body, but hardly a word has been said about the skin—its beautiful covering. Have you seen the body of a bird when its feathers have been removed? Or the carcase of an ox when the butcher has removed the hide? Our bodies would look much the same if they had not their smooth, comely covering of skin.

(2.) I fear you do not understand what a beautiful and useful thing the skin is. Though it looks so smooth and delicate, it is tough and elastic. It really consists of two layers. The outside layer we can touch, and even remove in small portions without feeling pain. This outer layer, or *cu-ti-cle* as it is called, protects the more delicate layer underneath. If it were not for the outside layer we could hardly touch or handle things without pain and bleeding. The under layer, or true skin, is full of small blood-vessels, and bleeds easily. It is also full of nerves, and readily feels pain. The cuticle grows up from the true skin in the form of scales. These outside scales rub off every time the skin is washed or rubbed. Thus the surface is being constantly renewed; and we show a new outer skin, or cuticle, every few days. Just under the cuticle, there are very fine grains of colouring matter. White races have not nearly as much colouring matter under the cuticle as the Red Indian, the yellow Chinaman, and the Negro.

(3.) Look at the skin on the backs of your hands: you see that it is full of tiny holes or *pores*. Here is a diagram showing what these pores really are. Each of them is the end of a small *drain-pipe, which brings from within the body some of its waste.* The skin, like the lungs, is one



SECTION OF THE SKIN—highly magnified.

of the chief means by which the blood is purified. The diagram shows you that the small drain-pipes go deep into the true skin. The bottom of each pipe is coiled into a little bundle called a *sweat-gland.* These sweat-glands take the moisture—called *sweat*—out of the blood which is in the capillaries around them. Sweat is warm water

with certain solid substances dissolved in it. When the sweat comes out upon the skin, the watery part turns to vapour, or *evaporates*. The solid matter remains on the skin: hence the need for frequently washing the whole body to remove the waste substances which the pores are always discharging. And hence the need for regularly and frequently changing our under-clothing, which absorbs much sweat, or perspiration, and in this way soon gets soiled. It is calculated that there are between two and three millions of sweat-glands, each with a little tube opening on the outer surface of the skin. The sweat is constantly coming off; sometimes it evaporates as fast as it comes off, and the skin seems dry. At other times, when we are very warm, or when we become warm by running, jumping, or other active exercise, the perspiration pours out freely, and the face and other parts become quite wet.

(4.) There are other glands in the skin besides the sweat glands. Near the root of each hair there are very small glands which give out an oily fluid. This fluid nourishes the hair, making it grow fast and strong. But some of it comes out upon the skin and keeps it soft and smooth. Have you noticed that when we wash ourselves, the water alone is not able to cleanse? The skin is greasy, therefore we use soap as well as water. We can never thoroughly cleanse the skin without soap.

(5.) The sweat-glands, with their many thousands of tubes, do other useful work besides serving as drains. *They regulate the heat of our bodies*—that is, they open, and let heat out when the body is

too warm; and they partly close when the body is cold and needs to keep in its warmth. It is the warm perspiration which brings some of the heat of the body to the surface. When the body is hot, the pores open and perspiration comes out rapidly. As it evaporates the skin is cooled. But when the pores begin to close they shut the perspiration within; then the body does not so rapidly part with its heat.

(6.) Sometimes we get chilled through sitting in a draught, or in wet clothes, or by getting our feet wet. The draught, wet clothes, or wet socks, chill the skin, and we *take cold* as it is called. The chill contracts the skin and drives the blood inwards. Besides this, it closes the pores and stops the perspiration. Now if the pores are shut and cannot do their proper work of removing waste, the other cleansing organs, the lungs and kidneys, have to do extra work. But these organs cannot well do extra work when the body is chilled, because the blood which is driven inwards goes to them and *congests* them—that is, makes them too full of blood. This is why congestion and inflammation of the lungs, and bronchitis, often follow a cold. The only way to guard against colds is to avoid chills, and to keep the skin active and healthy by out-of-door exercise and frequent washing.

(7.) We must not forget another very important use of the skin. Look very closely at the finger-tips and at the palm of the hand. You will easily see many little ridges running side by side. Within the ridges there are a large number of small bodies,

each of which is the end of a nerve. When anything touches the outside, we feel the touch by means of these small bodies. The skin is the organ of touch, just as the mouth is the organ of taste and the eye the organ of sight. The tips of the fingers, the tip of the tongue and the lips are the parts where these touch organs lie thickest together. This explains why the sense of touch is most delicate in these parts. What a wonderful sense the sense of touch is! With the blind it takes the place of sight. Most of the knowledge about things, which we get from seeing them, the blind can get by touch alone. There was once a girl who was blind, deaf and dumb. There was only one gate open to her mind, and that was *touch-gate*. Yet through this sense alone, her patient, clever teachers were able to teach her to talk, to read, to write, and to learn most things which girls of her age learn.

cu-ti-cle, the outside skin.

gland, an organ which takes from or adds something to, the blood flowing through it.

SUMMARY OF THE LESSON.

The skin consists of two layers, the outside layer or *cuticle*, and the inside layer or *true skin*. The true skin has nerves and small blood vessels, and therefore it can feel and bleed. The cuticle protects the delicate true skin. The skin is full of *pores;* they are the ends of small tubes running from the sweat glands which separate a good deal of waste matter from the blood running through them. These pores also regulate the heat of the body. If the surface gets chilled the pores close, and we suffer from what is called *a cold*. The skin is also the organ of touch.

Lesson XXVI.—How to Keep a Healthy Skin.

(1.) WHICH of you have seen a baby taking its morning bath? How it kicks and splashes with delight, and even cries when taken out of it! All well-cared-for babies get their daily bath—nothing which is done for them is more likely to make them healthy and strong. What is the purpose of this careful, daily bathing? Is it not that the baby may have a perfectly clean skin? And if a perfectly clean skin is necessary to keep a baby in good health, must it not be equally necessary in the case of those who are no longer babies? You may have thought that the clothing keeps the hidden surface of the body clean, but you can hardly think so after reading the last lesson. The perspiration contains a small amount of solid matter, which remains on the surface of the body when the watery part is evaporated. Besides its sweat glands, the skin contains a large number of *fat-glands*, and these send out small quantities of greasy matter upon the outer surface of the skin. Then you will remember that the outer skin, or cuticle, is being constantly shed in very small scales, too small for the eye to see, but not too small to help to make the body dirty. Hence every moment there are solid substances coming from the body, collecting on the surface of the skin, and choking its pores. As these substances are constantly collecting, is it not plain that they ought to be as constantly removed? Besides the dirt which collects on the skin from

within the body, there is the dirt which, in spite of our clothing, settles upon the skin as we walk about, play, or work. Here is another reason why the daily bathing, or *tubbing* as it is often called, ought to be practised by all who desire to keep perfectly clean and healthy bodies. Not merely the hands and face, but the whole body needs frequent washing; and if for any reason it is impossible to have a daily bath, then we must get one as often as we can. There is no other way of keeping the skin in a healthy condition.

(2.) In many houses a small bath-room is provided, and there can be no excuse if those who have the comfort and convenience of a bath-room, do not choose to make daily use of it. In houses where there is no bath room a substitute can be easily obtained. The large *hip baths* and the saucer shaped *sponge baths* are not expensive. If these cannot be got, a good, shallow wooden tub will serve the same useful purpose. All that is really needed is a wet sponge to sponge the body rapidly all over, and a good coarse towel to dry it.

(3.) When we use cold water for a bath we are said to have a cold bath. Many people take a cold bath every morning; it is most refreshing and invigorating for those who can endure it. The cold water at first produces a shock which is not pleasant. But presently the warm blood comes rushing back to the skin with increased force; and when the towel has been vigorously used for a short time, a warm and pleasant glow shows how much good our bath is doing. Everybody cannot

stand the shock of a morning cold bath. If the body remains chilled, and the pleasant glow does not follow the rubbing, this is a sure sign the cold bath is doing more harm than good. Such persons should take a *tepid bath*, that is, a bath in which the chill has been removed by adding some hot water.

(4.) The warm bath is very useful for cleansing purposes. It opens the pores of the skin and makes the blood-vessels relax. Hence it brings the blood to the surface, and thus acts exactly opposite to the cold bath, which at first drives the blood inwards. It is soothing and cleansing; but it should not be long continued, as it tends to enfeeble. It is not safe to go out into cold air immediately after a warm bath. It is well for everybody to take a warm bath once a week; soap should then be used. The morning is the best time for the cold bath and the evening for the warm bath.

(5.) A warm bath is one in which the temperature is not hotter than that of the body itself—viz., 100 degrees (100°). When the water is still hotter the bath is called *a hot bath.* Sometimes the hot bath is raised to a temperature of 110°; it then makes the skin red and perspiring, and is useful in severe colds. The so-called Turkish bath is really *a hot-air bath.* The bather reclines for a time in rooms made hotter and hotter until plentiful perspiration is produced. Then his skin is well rubbed and washed with soap and water. He then rests for a time in the cooling room until his skin is cool and dry. Perhaps no other

bath so thoroughly cleanses the skin as the Turkish bath.

(6.) All boys and girls should learn to swim. Swimming is a splendid form of bodily exercise; and no mode of washing is more enjoyable or stimulating than swimming, especially in the sea.

tep-id, moderately warm.

in-vig-or-a-ting, strengthening.

SUMMARY OF THE LESSON.

Daily bathing is necessary for keeping an infant in perfect health; it is still more necessary for those who are older. Those who are strong should take a morning cold bath, followed by a brisk rubbing with a coarse towel. Warm baths should be taken occasionally in the evening. Swimming is the most healthy and invigorating form of bathing.

Lesson XXVII.—Warm Clothing.

(1.) ONE cold winter's evening, after Mr. Price had finished his tea, and the children had prepared their lessons for next day, he asked them what fresh knowledge they had learned at school. Sarah, the elder girl, was the first to answer. "Mr. Francis gave us yesterday a lesson about warm clothing. It made me think of the pleasant talk we had the other night about how our bodies are warmed." "I am sure Mr. Francis could not have chosen a more seasonable subject," said Mr. Price. "The

cold weather has made your mother put extra blankets on the beds, and you see she is very busy mending your thick winter socks. Well, what did your teacher tell you about warm clothing?" "He first of all questioned us about the materials used for clothing, and how they are obtained," said Sarah, "and as we answered he wrote them upon the blackboard. I thought of the beautiful, warm furs which come from the bear, the fox, the seal, and other fur-bearing animals." "I remembered the wool of the sheep from which all our woollen clothes are made," said Jane. "And I thought of the silkworms which I kept last summer, and told Mr. Francis that silkworms spin the beautiful threads from which silks are made," said Harry. "Well done, Harry," said his father. "Probably you would have forgotten the silk had not your own silkworms reminded you of it. What other materials were thought of?"

A Cotton Pod.

"Someone else mentioned cotton," said Sarah. "Then Mr. Francis showed us a cotton-pod. He said that it was the seed-pod of the cotton plant, and that the cotton is only the soft, downy substance in which the seeds grow. He reminded us

of the many articles of clothing which are made of cotton." "There was one material which we all forgot," said Harry. "It was linen. This is supplied by the flax plant. Mr. Francis told us that the fibres from which linen is made are taken from the stems of the plant."

THE FLAX PLANT.

(2.) "I notice you have not named leather, which is made from the skins of animals, nor the feathers which are used as ornaments," said Mr. Price. "What use did your teacher make of this list of clothing materials?" "It was written out again," replied Sarah. "But this time all the materials were arranged in two groups: fur, leather, and wool were called animal substances; and the cotton and linen were called vegetable substances. Mr. Francis also reminded us that the warm clothing all belongs to the group of animal substances; and that the

cotton and linen from which cooler clothing is made, are vegetable substances."

(3.) "What I should like to know," said poor Dick, who always listened eagerly to what his brother and sisters said about their lessons, "what I should like to know is, why the fur, the wool, and the silk are so much warmer than cotton and linen. I do not see why they should be warmer." "They are not warmer in themselves, Dick," answered Sarah. "Mr. Francis had pieces of fur, cloth, silk, flannel, calico and linen, all on the table together; and he showed us that they were all at exactly the same temperature. First of all he told us to feel them. We all thought the fur, and the cloth and flannel which are made of wool, *felt* warmer than the calico and the linen. But Mr. Francis explained to us that there is only one trustworthy way of telling the temperature of things, and that is to test them with a thermometer. He said that if the thermometer were wrapped round with either the fur, cloth, flannel, silk, cotton, or linen, it would show exactly the same number of degrees of heat."

(4.) "But if they are all just as warm as one another, why did the fur and cloth feel warmer than the linen and cotton?" asked Dick. "Mr. Francis explained that to us," replied Sarah. "He said that the cotton and linen are *good conductors of heat*, and the fur and woollen are *bad conductors*. Then he worked a simple experiment, which we can do presently, with father's and mother's help. He poured some hot water into a glass tumbler until it was half full. He then placed a spoon, a

bone paper-knife, and a slate pencil to stand in the hot water, and called out two of the elder boys to see which of the three things got hot first." "I think I know which of them got hot first," said Mr. Price. "It would certainly be the spoon, for I know no substances which get hot so quickly as metals." "Yes, father, you are right. The spoon got hot much quicker than the paper-knife and the slate pencil. Mr. Francis said that heat travels faster through metals than through other things, and that this is why they are called *good conductors of heat.* Heat travels but slowly through wood, and still slower through a piece of slate, therefore they are called *bad conductors.* Mr. Francis said he would not tell us which were the good and bad conductors among the clothing materials, because we could find out that for ourselves if we carefully watched his next experiment."

(5.) "Did you watch these experiments, Harry?" asked his father. "Yes, father, I watched all that the master did. Before the lesson began we saw him take some stones, one by one, from a basin of hot water. The first stone he wrapped in a piece of fur, the next in flannel, the third was covered up carefully in a piece of calico, and the fourth in linen. Then the covered stones were placed on a table and left to get cool. During the lesson Mr. Francis said, 'Now we will see whether the stones are cool yet.' We uncovered the stone wrapped in fur, but it seemed as hot as when it came out of the water. The stone wrapped in flannel was also hot. The stone covered with

calico was not nearly so hot as that wrapped in flannel; while the stone wrapped in linen was almost cold." "And were you able to tell your master what the experiment proved?" asked Mr. Price. "Yes, father," said Harry, "we had no difficulty in seeing that the fur had not let the heat of the stone pass through it, because fur is a bad conductor of heat. We could also see that wool is a bad conductor, although it is not so bad a conductor as fur. We were also able to tell that the stone wrapped in linen had become cold, because nearly all its heat had passed through the linen; and that linen is a good conductor compared with fur or woollen."

(6.) "There is another experiment which I should like to try," said Sarah. "Mr. Francis told us to try it as soon as there is plenty of ice. He said we might wrap small lumps of ice in fur, in flannel, in cotton, and in linen, bring them into the warm kitchen, and notice the order in which they begin to thaw." "I think I can tell that," said Dick, "without waiting to try it. The fur is the worst conductor; therefore it will prevent the heat of the warm room getting to the ice. The linen is the best conductor, and therefore the heat will easily get through it and thaw the ice." "You are quite right Dick," said Sarah. "Bad conductors carry heat very slowly in either direction. When anything warm is wrapped in fur, or wool, or silk, it will not quickly get cold; and if it be cold when it is wrapped up, the outside heat cannot readily get to it to make it warm."

(7.) "How did your lesson end?" asked Mr. Price. "Mr. Francis added a few more words to the summary on the blackboard, saying that fur, woollen, and silk, are warm materials because they are bad conductors of heat, and that cotton, and especially linen, are not warm because they conduct heat very readily."

sea-son-a-ble, suited to the season.

con-duc-tor, a thing which carries, or leads, another thing.

SUMMARY OF THE LESSON.

Nearly all our clothing is made either from animal substances —such as fur, feathers, wool, silk, and leather: or from two vegetable substances, cotton, and flax from which linen is made. Our warm clothing is made from animal substances. These substances are not warmer in themselves; but they are bad conductors of heat—*i.e.*, they only let heat pass slowly through them. Hence clothing made from them does not let the heat of the body readily escape. Cotton is a better conductor than wool; but linen is the best conductor, and therefore makes the coldest clothing material.

Lesson XXVIII.—Clothing for Winter and Summer.

(1.) IF you were now asked what clothing materials are best for winter wear, I think you would at once answer, "Furs and woollens are best, because they are bad conductors of heat, and, therefore, prevent the warmth of the body escaping." And if you were asked to name the materials best

for summer you would probably say, "Cottons and linens, because, being good conductors, they let the heat of the body escape, and so keep us cool." But clothes have another important use besides that of keeping the body comfortably warm.

(2.) In Lessons XXV. and XXVI. you learned that the skin is one of the chief means by which the body gets rid of its waste. You learned that the millions of pores in the skin are always giving off warm water, either as *invisible vapour*, or as liquid perspiration *or sweat*. Now it is just as necessary that the perspiration should at all times pass freely away from the skin, as it is necessary for the skin to be kept comfortably warm. This is why clothing made of fur would not be healthy for constant wear, even in winter. It would keep in bodily warmth, *but it would not let out the perspiration, because it is not porous*. You can easily prove this by placing a piece of fur, skin downwards, in a plate on which water is poured. Neither the skin, nor the fur growing out of it, will let water pass easily through them. Woollen garments keep in the heat, and, being very porous, they rapidly absorb the moisture given off by the skin.

(3.) Cotton materials and linen are also porous, and will easily absorb moisture, yet they are not good materials to wear next the skin. They are as you know, good conductors of heat, hence they quickly part with heat and become cold. This is why calicoes and linens next to the skin feel cold and chilly, when they are soaked with perspiration.

Woollen materials, even if wet with perspiration never feel cold, because they retain their heat. People who are wise always wear woollen garments next the skin, *even in hot summer weather;* there is little or no danger of catching cold, even if we perspire much. The woollen clothing should not be as thick in summer as in winter, and the outer garments may be safely made of calico, cotton print, muslin, or linen. The inner, woollen clothing prevents the skin getting chilled; and the outer clothing keeps the body comfortably cool.

(4.) You know that the tribes that live in the coldest parts of the world find it necessary to clothe themselves in furs and skins. How do the tribes dress that live in the hottest regions? As you know, those that are savage wear little clothing of any kind. They do not need it for warmth; and, being savages, they have little thought for what is decent and becoming. Their dark skins seem to be a protection against the sun's scorching rays, and their scanty clothing consists of strips of calico or linen. Civilized people living in hot countries like India and Central Africa, dress in loose clothes made of linen and calico, the coolest materials they can choose. Their favourite colour is *white*—the coolest colour because it *reflects*, or *throws back*, the rays of heat which fall upon it. When next the snow lies on the ground there is an easy experiment which you may try for yourselves. Get a few pieces of calico or cloth, some lighter and some darker in colour, and lay them on the snow. You will find that the snow melts

under the darker pieces, while under those that are white, or nearly so, it does not melt at all. The darker colours *absorb the heat of the sun*, the lighter colours *reflect* it all, or nearly all. This will explain to you why a black coat or dress is too hot for summer wear, but warm and comfortable for winter.

(5.) Clothing of all kinds, whether caps for the head, gloves for the hands, shoes for the feet, or garments for the body, should never fit tightly. It may seem to you that a garment which fits the body closely must be warmer than one which fits loosely: but this is quite wrong. A garment that fits easily is really warmer than one that lies quite close to the skin. Air is a bad conductor of heat. When a garment fits loosely, there is a layer of air which acts as a non-conducting covering between it and the body. Two light woollen garments are always warmer than one heavy one, because there is a thin layer of non-conducting air between them. One reason why flannel is warmer than calico, and much warmer than linen, is that its surface is looser, and rougher, and holds much air. *Flannelette*, which is rougher and warmer than calico, is not made of wool, but of cotton having a loose, fluffy surface to look and feel like wool. It must be always remembered that flannelette is very *inflammable*, and, like all cotton materials, very easily catches fire · while flannel, being made of wool, only shrivels up.

(6.) What you have learned about perspiration will remind you that our under-clothing, and all clothing next to the skin, requires to be changed

frequently. The water passing from the body through the pores of the skin contains some solid matter: the oil glands secrete and send out an oily substance. These waste materials are *dirt* if they are allowed to remain on the skin; and they are *dirt* if absorbed in the underclothing. If our underclothing is white, the dirt soon becomes visible. But whether we see it or no, *it must be there.* It will be of little use to try and keep the whole body clean by frequent baths, if we do not regularly and often, change our under garments for clean ones. It has been calculated that the amount of perspiration given off by a man is *never less than two pounds a day*, and often much more. The two pounds of sweat probably contain not less than one-third of an ounce of dirt. It is no wonder, then, that the underclothing becomes soon soiled and unfit to wear.

SUMMARY OF THE LESSON.

Woollen clothing is best for winter; for wearing next the skin it is best for summer as well as for winter. Calico and linen are useful materials for outside wear in hot weather; but next to the skin they get damp with perspiration and feel cold and chilly. It is a mistake to wear closely fitting garments. Two thin, loosely fitting garments are warmer than one thick, closely fitting one, because there is a layer of non-conducting air between them.

Lesson XXIX.—Common Mistakes about Clothing.

(1.) CLOTHING has so much to do with health, that it may be well to have a lesson on some of the mistakes made respecting it. You already understand why good, winter clothing is *warm;* it is made of materials which are bad conductors of heat, and therefore *keep in* the warmth of the body and *keep out* the cold. The mistake often made about winter clothing is that of supposing it ought to be heavy. Heavy clothing, especially for the old and feeble, wearies by its weight; good, woollen clothing is light, and it is always far warmer than cheap, thick, heavy materials containing a good deal of cotton and very little wool. You have already learned that two, light, woollen garments with a layer of air between them are warmer than one, thick, heavy garment.

(2.) Perhaps the most serious mistake we can make in winter weather, is to pass from warm rooms into the cold, outside air, without putting on additional warm clothing. In this way many get a sudden chill, which may end in severe cold or other serious illness. Another common mistake, equally dangerous, is that of leaving off warm clothing before the winter has quite gone. The few, fine, warm days which sometimes come at the end of February, or early in March, may tempt us to put off some article of clothing, or to change thicker for thinner woollens. This is why the first appearance of fine weather is often followed by many

colds and sore-throats. The warm clothing has been thrown off too soon, before the season of cold, chilling, east and north-east winds is over.

(3.) We also make mistakes about summer clothing. In summer we want cool clothing, that is, clothing which will let the heat of the body easily escape. This is why some are foolish enough to put off woollen under-clothing, which keeps in bodily heat, and to put on linen and calico garments, which permit of heat escaping quickly. But calicoes, and especially linen, let heat escape so quickly that the skin gets chilled. Besides this, the moisture in the garment next the skin gets chilled, and so makes it a cold, wet covering. It is worth while repeating what you were told in the last lesson—viz., that in our climate, woollen garments ought to be worn next the skin all the year round. Then calicoes and linens may be worn outside during the summer with safety as well as comfort.

(4.) In the last lesson you also learned, that it is a mistake to think tight garments are warmer than those which fit loosely. It is well to remember that tight garments are hurtful to the parts of the body they cover, by pressing upon the flesh and hindering the free circulation of the blood. This is why it is a mistake to wear a cap or hat which fits the head too tightly; or sleeves that fit the upper arm or wrist tightly. Neither can the limbs move freely and naturally when they are cramped with tightly fitting garments; nor the head, when the neck is enclosed in a stiff, close collar.

(5.) The hands and the feet suffer much through

tight gloves and tight boots. Woollen gloves keep the hands pleasantly warm in cold weather; but gloves which can only be got on with difficulty, prevent the free circulation of blood in the fingers, and thus encourage chilblains. Boots and shoes should always fit easily. Tight boots not only hinder the circulation and help to cause chilblains:

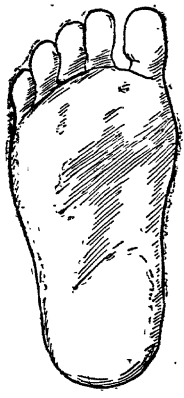


Fig. 1.

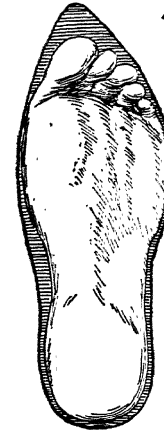
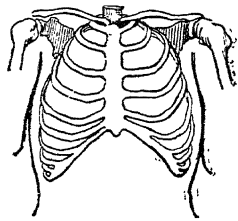


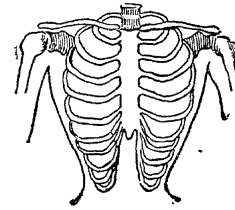
Fig. 2.

they produce corns and bunions. Corns are merely the thickening of the cuticle, or outside skin, when a tight boot presses upon it, or a badly-fitting boot rubs it. Tight, badly-fitting boots often spoil the natural shape of the foot. Fig. 1 shows you its natural shape; Fig. 2 represents the foot as it is

often seen. Notice how the toes may be squeezed and deformed, through a badly shaped boot. A good comfortable boot has soles, broad under the toes, and good, broad heels, not too high.

(6.) There is no part of the body which more requires to be free from the pressure of tight clothing than *the Chest.* What is the Chest? A curious, wonderful cage of bones, called the ribs, made to hold the heart and lungs, and to protect these vital organs from outside pressure. Yet not a few women and girls wear clothing round the chest and waist, so tight as to force the ribs closer together, and prevent them moving freely as they





ought to do. If you ask why they do so hurtful a thing, the only answer I can give is, that they seem to think a small, pinched-in waist looks nicer than the natural waist. All girls should regard tight lacing as a wicked, as well as a foolish habit, which is certain, sooner or later, to injure their health, even if it does not cut short their lives, as it has done in many, many instances. The diagrams show the framework of the natural chest,

and of the chest as deformed by tight lacing. The natural chest allows plenty of room for the heart and lungs to do their important work. The deformed chest does not leave them enough space; the whole body therefore suffers, because the breathing and circulation cannot go on properly.

(7.) There are other mistakes about clothing, which may seriously hurt the healthy. Many people catch cold and become ill by getting damp feet. Thick soles and warm, woollen socks should be worn in winter: whenever the feet chance to get wet, we should change our boots and socks as soon as possible. Damp garments are as dangerous as wet feet: yet children will often thoughtlessly stand about in wet clothing, instead of making haste home to change.

(8.) Remember that clothing cannot be healthy unless it is kept perfectly clean; that underclothing must be often changed, because it gets quickly saturated with what comes through the skin; and that the outside clothing should be kept neat and clean, not only because it looks nice, but because the underclothing cannot be kept clean, if the outer clothing is torn and dirty.

vi-tal, necessary to life.

de-form-ed, out of its proper shape.

sat-u-ra-ted, soaked.

SUMMARY OF THE LESSON.

Winter clothing must be warm, but need not be heavy. Extra clothing should be put on when we leave a warm room to face cold, chilling weather outside. It is a serious

mistake to leave off winter clothing too soon. Tight clothing, whether hats, boots, or body garments, is hurtful; and tight-lacing is still more hurtful. Damp feet and wet clothing often cause severe illness. Frequent change of underclothing is necessary for good health.

Lesson XXX.—How the Body Moves.

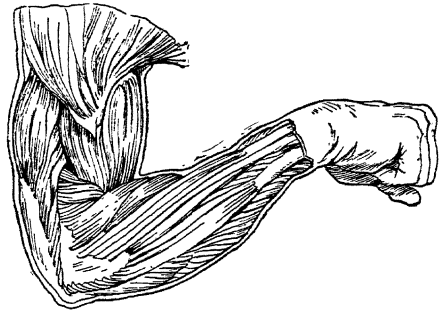
(i.) The Muscles and their Work.

(1.) THE living body is always moving. Even when we are fast asleep, the heart continues to beat, the chest rises and falls as we breathe in and out, and the blood flows unceasingly through veins and arteries. Besides those movements with which we have nothing to do, there are the many movements which we ourselves cause. We can move our limbs, we can walk, run, sit, stand. We can either move the whole body, or we can move one or more of its different parts, or organs. We can also cause other things to move, as when we throw a stone, carry a parcel, or push anything out of its place. How does the body move? And where does the force come from, which enables the body to move itself, and to move other things?

(2.) To be able to answer these questions, you will need to know a little about the *framework* of the body, or *skeleton*, as we call its framework of bones. This framework consists of about 200 bones of different shapes and sizes. They are formed of two kinds of material: a tough, jelly-like substance,

or *gristle*, which makes them elastic; and some mineral substances, which make them hard. The growing bones of young children do not contain much mineral substance; the bones of old people contain a good deal of it. This is why the bones of the aged are brittle and easily break, while children's bones are more elastic. Without the bones we could neither stand nor move a limb; we might perhaps be able to crawl as a worm crawls. No part of the skeleton is seen; the whole is covered with flesh, and the fleshy parts are covered with the skin.

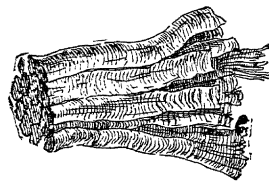
(3.) When the paper is stripped from the walls of a room, the surface underneath is smooth and even. If the skin were stripped from the body, we



should see the fleshy parts underneath; but the surface of these fleshy parts is not even. The sketch shows you, that the flesh of the arm does

not lie over the bones in one piece; you may see several, long pieces lying along the bones, one lapping over another. Each of these portions is called *a muscle.* There are no less than 500 muscles in the body. Some are large, like those in the arm; some are very small; but every one is useful; *and every one helps the body to move. The work of a muscle is to move, and when it moves it sets other parts moving.*

(4.) You may easily see what a muscle is like, by looking closely at a piece of lean beef or mutton. You may have noticed that when lean meat has been boiled too much, it breaks up into long, thin, stringy pieces, or *fibres.* Every muscle



FIBRES OF MUSCLE.

is a bundle of these fibres, lying in order side by side. Each fibre has a wonderful property: *it can get shorter; and as it gets shorter it gets thicker.* When the fibres which make a muscle get shorter and thicker, the whole muscle gets shorter and thicker. A muscle is always thicker in the middle, and tapering towards its two ends. Have you ever raised your fore-arm and said to a playmate, "*Feel*

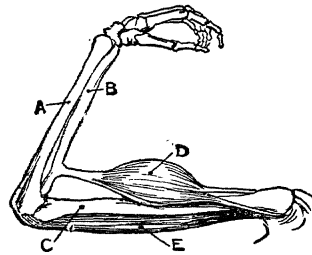
my muscle"? As you raise the fore-arm, the muscle of the upper part of the arm gets shorter and thicker; *it moves, and in moving, it changes its shape.* Every muscle in the body moves by changing its shape; and when it changes its shape, it *gets shorter, or contracts.*

(5.) Have you ever considered how little use our bodies would be, if we could not move them? Of what use would our body be, if it required to be carried, like a log of wood, from one place to another? Of what use would the arm be, if we could not raise it, or the hand, if we could neither shut nor open it? We could not open nor close the eye, nor turn the hand, nor move the tongue, if we had no muscles; and every muscle moves other parts by first changing its own shape.

(6.) But how can a moving, contracting muscle make other parts move? You have often seen a door made to shut itself when it is pulled open. An elastic spring is fastened with one end to the door and the other to the door-frame. When the door is opened, the spring stretches; but the moment the door is loosed, the spring contracts and pulls to, the door. Every muscle, when at work, is like the contracting spring, and it pulls hard at whatever is fastened to it. The diagram shows you the muscles and bones of the arm. A and B are the bones of the lower arm. They are joined to C, the bone of the upper arm, by the elbow joint. D is the large muscle on the upper arm. One end of it is attached to the shoulder by two tough cords, or *tendons;* and the other end is fastened

by a single tendon, to a bone of the lower arm. When we wish to raise the lower arm, this powerful muscle contracts, and then pulls up the lower arm. You will notice another muscle marked E. When this muscle contracts, it pulls the lower arm down again.

(7.) If we want our muscles to become strong, we must use them. The arm or hand that we use most, becomes stronger than the other. Muscles



must not only be used; they must be used properly. If left long without exercise, they begin to get small and flabby: therefore they need regular exercise to keep them in good order. But we must not over-work them. A painful feeling of weariness tells us when muscles are tired. They need regular rest as well as regular work. When men are strengthening their bodies for running, rowing and wrestling contests, they fix regular hours for out-of-door exercise and regular hours for rest. They

are careful never to strain the muscles by exercising them too violently. They eat simple, wholesome food, such as makes good blood; for only good blood can make good muscles. And they wisely abstain from intoxicating drinks, which hinder, rather than help, the muscles and their work. Many of the best athletes avoid both alcoholic drinks and tobacco, when they are training for severe contests. You will learn in a later lesson why these things hinder bodily work.

un-ceas-ing-ly, without stopping.

flab-by, not firm.

ath-lete, one who excels in any kind of bodily exercise.

SUMMARY OF THE LESSON.

The skeleton, or bony framework, is covered by the flesh, and the flesh is hidden and protected by the skin. The lean flesh is made up of separate pieces called *muscles*. A muscle tapers towards its two ends and is thickest in the middle. It is made up of strings, or fibres, lying side by side. These fibres have the power of getting shorter or contracting: as they contract they move those parts of the body to which their ends are fastened. Nearly all the movements of the body and its organs, are caused by the contractions of the muscles.

Lesson XXXI.—How the Body Moves.

(ii.) The Joints.

(1.) How pleased a little girl is with a doll, especially if it is a doll with a body and limbs which will bend! Some dolls always keep in one stiff, straight position. This is because they are made all in one piece. The dolls which can be placed in different positions, are made in several pieces, and they will bend wherever there is *a joint.*

(2.) If the bony framework of our body had been made in one piece, we should not be able to move. Think of the many movements the body and its parts can make. The head can nod, shake, and turn; the body can bend to make a bow, turn round, and rock from side to side. What a large number of movements the arm and hand can make! This is because there are so many joints in the body and its limbs. If we had only as many joints as a wooden doll, we could make only a few movements. Although the doll has joints, it cannot move them. Joints cannot move of themselves. In our bodies it is the contraction of the muscles which moves the joints, as you learned in the last lesson.

(3.) Workmen use different kinds of joints, according to the kind of movement they wish to get. A door, and a two-foot rule, only require to be moved backwards and forwards. In these cases, the door is fastened to its framework, and the two halves of the rule are fastened to each other, by

a hinge. Look at a pair of scissors, and see how the two pieces which form them are moved. To one piece there is fastened a little peg, or *pivot* of iron, and the other piece has a hole in it through which the pivot passes. Such a joint is called *a pivot joint.* When a joint is needed which will allow movements in almost any direction, the beautiful joint called *the ball and socket joint* is used. It consists of a hollow cup in which a polished ball exactly fits. We can find examples of all these three joints in our own bodies.

(4.) When you shut and open the hand you notice that the joints of the fingers will only move one way; they are *hinge joints.* The knee-joint and the elbow joint are also hinge joints. This

ELBOW JOINT.

explains why we can only bend the arm or leg in one direction. The toe joints, the wrists, and the ankle joints are of the same kind. The diagram shows you the hinge joint which forms the elbow.

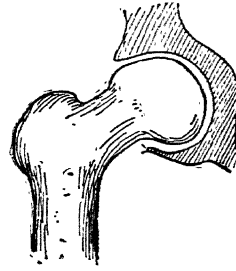
You see how the round end of the upper bone of the arm fits nicely in a socket, at the end of one of the lever bones. But you will want to know why the upper bone does not slip out of its place, since you can see nothing to fasten it. It does not readily slip out, because, on each side of the joint, there are stout bands of gristle, called *ligaments*, which hold both bones securely together.

(5.) If you raise your arm and begin to swing it, you will find that you can easily move it round in a circle. This is because the joint, which fastens

SHOULDER JOINT.

the upper arm to the shoulder, is a *ball and socket* joint. The end of the upper bone of the arm is beautifully rounded, and fits exactly into a socket on the under side of the shoulder bone. The upper leg bone also fits into a socket in the hip bone.

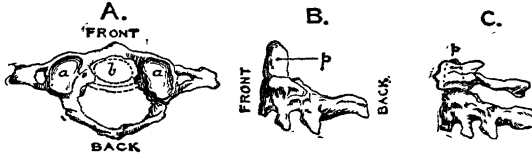
The sketch shows the cavity in the hip, and the round-headed bone which fits it. The cavity is deeper than that at the shoulder. This is why the



HIP JOINT.

hip joint is not so easily put out of its place as the shoulder.

(6.) There is one good example of a pivot joint in the body. The back bone, which as you know,



supports the head, is made up of 24 bones. The top bone, A, carries the head upon it. The head rests in the two smooth hollow cavities marked *a*. When you nod your head, it moves backwards and

forwards in these two hollows. The round hole marked *b*, fits over the little peg or pivot of bone *p*, seen in the next sketch B, which shows the second bone. When we shake our head from side to side, the top bone moves round on this little bony pivot. The sketch C shows both bones in their place.

(7.) Doors sometimes creak on their hinges; and the joints which workmen make must be well oiled and cleaned, or they will soon creak and get stiff. How is it that the many joints in our bodies never creak, and go on, year after year, working so smoothly and easily? One reason is that the Creator has made them to fit very exactly and smoothly. Where the ends of the bones meet together to form a joint, they are covered with very smooth gristle; and the joints are always well oiled, because they have the power of secreting the oil they need to make them work easily and smoothly. How wonderful it is that the numerous joints in our bodies work so well for many years, and keep themselves in good repair, and well oiled!

(8.) You will now begin to know how the muscles and joints enable us to move our bodily organs. But there is much more to learn, before you can understand how both muscles and joints are obedient to our will, and move when we wish them to move.

li-ga-ments, the tough, gristly bands which tie bones together.

se-cret-ing, separating from the blood the oil which the joints need.

SUMMARY OF THE LESSON.

Our bodies can make many movements because they have many joints. Some of the joints are hinge joints, such as those of the elbow, knee, ankle and wrist. Some are ball and socket joints. The shoulder and hip joints are of this kind. The head, resting on the top of the back bone, turns round on a peg, or pivot of bone. The joints are secured and protected with stout bands of gristle. The parts of the joints which touch each other, are beautifully smooth, and keep well oiled.

Lesson XXXII.—Bodily Exercise.

(1.) IF you turn back to Lesson IV., on "*Some Things the Body Needs*," you will find that bodily exercise and rest are both mentioned. Bodily exercise simply means setting our limbs to do what they were made to do. We exercise the hand and arm when we hold, lift, pull, or carry. We exercise the legs and feet in walking. In some kinds of exercise, such as walking, running, jumping, and swimming, we move every part of the body. The body, as you have learned, contains a large number of muscles, all made for moving. Bodily exercise is muscular exercise.

(2.) No healthy living creatures—not even animals, birds, fishes, or insects—like to remain a long time without moving. Watch the swallows swiftly pursuing each other, the fishes as they swim through the clear water, the busy common flies as they dart in and out of the window. What enjoyment

they all seem to find in their nimble, merry movements! Watch the baby as it crawls, and coos, and moves about its head and limbs. While it is awake it is never still, never at rest. What pleasure it finds in its movements! Why do all healthy, living beings so much enjoy exercise? Just for the same reason that they all enjoy food. *The body needs exercise just as it needs food;* and it needs exercise because it was made for exercise, and cannot be healthy and happy without it. Poor Dick Price never gets bodily exercise, because he cannot even walk about. He misses it very much, especially when he sees his brothers and sisters enjoying their play. How pale and thin he looks! How poor his appetite is, compared with Harry's! If he could only run about in the fresh air, his cheeks would soon become as plump and rosy as those of his brothers and sisters.

(3.) It would take a long time to explain all the good that comes from bodily exercise. It strengthens the muscles, making them grow larger and harder, so that they can work better. If you enquired of Mr. Price how the muscles of his arms become so thick and powerful, he would probably tell you that it was through swinging his heavy, sledge hammer, day after day, and week after week, while he works at the anvil. The muscles only grow and get strong by exercise: if for any reason we cease exercising them, they soon get smaller and softer, and become unable to do the tasks that used to be quite easy.

(4.) Bodily exercise also makes us breathe better.

Notice your own breathing after you have been walking sharply, or running. You will find that you not only breathe faster, but you begin to take deeper breaths. This means that your lungs are getting larger supplies of fresh air, and taking from it more oxygen. You have learned how "*busy-body oxygen*" is carried round the body in the circulating blood, and that, as it travels along, it slowly burns up bodily waste. When Mr. Price blows his large bellows, the fire on the hearth begins to burn faster, and speedily becomes bright and fierce. Just in the same way, when the blood gets larger supplies of oxygen, our "*living stove*" burns faster and better; the heart begins to beat quicker and stronger; and the whole body becomes warmer. This explains why the best way to get thoroughly warm on a cold winter's day, is not to do what poor Dick Price does, sit near the fire and wear extra clothes, but to take brisk, out-of-door exercise, until hands, feet, and the whole body, begin to glow with healthy warmth.

(5.) Notice how one benefit of exercise leads to another. When exercise makes us begin to take deeper and fuller breaths, the lungs work better and send the purified blood faster to the heart. The heart at once beats quicker and stronger to drive the blood round the body. The living-stove burns faster; the body becomes warmer; and the warm blood, finding its way to the skin, opens the pores and quickens the perspiration. When the blacksmith's bellows blow up the fire, the fuel begins to burn faster, and fresh coals must be

supplied. So it is with the body. The fuel we take in the shape of food, burns up faster through exercise. This is why exercise makes you hungry, and sends you indoors with a sharp appetite for food. Dick Price watches Harry and Jane with amazement when they came into tea, after a brisk run across the common with their hoops. He can scarcely eat one, thin slice of bread and butter; they speedily eat several, good, thick slices, and then are hardly satisfied. He cannot understand how exercise can give them such an appetite.

(6.) A watchmaker will tell you, that it is better to keep a watch wound up and going, than to let it stop and remain idle. An engineer will tell you that it is far better to let a steam-engine keep working than to let it stand still. It is exactly the same with the body. When by regular exercise all the muscles are kept at work, the body is far healthier than when they are idle. When the bodily machinery is working well, then we feel well. Good health simply means that condition, in which all the organs of the body are doing their work regularly and well.

(7.) How do you get your bodily exercise? Chiefly by the play which you enjoy so much. Mr. Price gets all the exercise he needs, not from play, but from hard daily work; and Mrs. Price works hard too. From early morning until bed time she has little time for rest: cooking, cleaning, mending, and attending to her household duties, keep her fully occupied. Both husband and wife are happy with their useful labour. Your merry play is not labour;

but it is useful exercise, because it is preparing your bodies for labour by making them healthy and strong. Always play fairly and unselfishly, and your play will help you to grow up, not only with strong, active bodies, but also with kindly, unselfish dispositions.

mus-cu-lar, belonging to the muscles.

en-gin-eer, the person who manages an engine,

ma-chin-e-ry, the working parts of a machine.

SUMMARY OF THE LESSON.

Exercise is almost as necessary for the body as food. We exercise the body when we use the muscles in any way. Bodily exercise strengthens the muscles, improves the breathing, and quickens the circulation. It purifies the blood by causing the lungs to take in more oxygen, and by quickening the perspiration. It improves the appetite; and, by causing the "living stove" to take in and consume more fuel, it increases its warmth.

Lesson XXXIII.—Rest and Recreation.

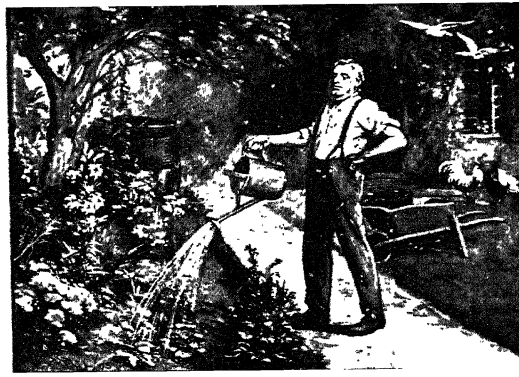
(1.) How pleasant bodily rest is when we are tired! It is pleasant, because when the muscles are wearied, the thing they most want is rest. When a steam-engine has worked until some of its parts begin to wear out, it is taken to the workshop to be repaired. The muscles are always wearing out when exercised. Besides this, they give up their strength when working. Hence they need rest—rest for repairing the worn-out

parts, and rest, so that they may regain strength. How do we know when we ought to rest any organ of the body? The organ tells us itself. The feeling of fatigue is the voice of the organ, saying that it is time we ceased exercising it. Rest ought to be as regular as work. One part of each day we give entirely to rest. When we fall asleep, both body and mind refuse to work any longer. And just as we give a part of each day to rest, so we give one day out of every seven to rest from our ordinary work, according to God's commandment.

(2.) The best rest is sound sleep, because it is perfect rest. During sleep the body refuses to make any effort: even the eyelids close. We neither see nor hear; a touch is not felt; and a good shaking hardly disturbs us. The lungs must go on breathing and the heart must beat during sleep; but even these tireless organs do not work nearly as hard as in our waking hours. During sleep there is very little bodily *waste*, because there is so little bodily *work*. Then all repairs are made good, and strength is renewed, so that we awake refreshed and ready for another day's work. Eight hours' sleep is enough for an adult; children want ten hours; and babies, as you know, sleep fifteen or sixteen hours a day.

(3.) We need rest in our working hours, as well as the perfect rest which sound sleep brings. When Mr. Price lays aside his leather apron after a hard day's work in the forge, he does not return home merely to take his evening meal and go to

bed. He wants rest, but he does not want to be idle. He goes into his garden and tends the flowers; he weeds and waters the beds; he feeds his pigs and poultry. He changes the hard work of the forge for the easy and pleasant work of the garden. He does not call what he does in the garden *work;* he calls it *recreation*. Your recreation is



play; Mr. Price's recreation is *change of employment*. Gardening is a *pleasure*, because he is fond of it; it is *rest*, because he is exercising his body in a different way to what he does when he is in his smithy. Remember, rest in our working hours never means idleness. The best rest is entire change of occupation.

(4.) Some people take most of their recreation out-of-doors; and if their daily employment keeps them in an office or workshop, out-of-door exercise, such as cycling, cricket, football, and swimming, is what they most want. But during the long winter evenings, all are glad of indoor recreation. We cannot find indoors much exercise for the body; but we can find pleasant recreation for *the mind;* and that is quite as necessary as bodily exercise, if we wish to lead healthy, happy lives. How pleasant it is to sit by the fireside and read an interesting book! What pleasure we can find, both for ourselves and others, if we learn to play some musical instrument! There are also many innocent, harmless, indoor games which brothers and sisters can share.

(5.) But some recreations, both out-of-doors and indoors, are not harmless. There was a time when dog-fighting and cock-fighting were common amusements; and these brutal, cruel sports have not entirely ceased. Many men flock to the football field or the race-course, not so much for the football or the racing, as for the foolish and hurtful practice of betting. No kind of recreation which leads us to be cruel, or to bet, can be wholesome for us. Many even find their recreation in a beer-shop, wasting time and money on what is hurtful to health, strength, and character. It is well to remember, that even the most harmless kind of recreation may become hurtful. If we spend time upon it which ought to be given to other things; if it begins to take up too much of our thoughts;

if it unfits us for more serious matters; or if it leads us into bad company, we ought to give it up, for it is doing us harm.

(6.) There are certain kinds of recreation known as *hobbies*. A hobby means some one pursuit in which we take special delight. Long ago *the hobby* was a kind of falcon, which was trained to fly at and kill other birds. Hunting with a hobby wa-

A Royal Hawking Party.

then a favourite sport; now the word "hobby" means any favourite occupation. One boy makes the collection of birds' eggs his hobby; another collects postage-stamps or picture cards; another keeps silk worms, and another, white-mice. Flower growing, photography, rearing canaries or pigeons, painting, carpentry, these and many more hobbies

are often followed. It is well for everybody to have a hobby, provided it does not cause time and money to be wasted, and neither makes us jealous of others, nor covetous of what others possess. A pleasant hobby will be a relief from your ordinary work, and will keep you out of mischief. Young men often fall into bad habits, because they have no favourite recreation for their spare hours. Many learn to smoke, to bet, to drink, and to keep bad company, merely to fill up their idle hours. Those who attend evening classes for study, for singing, or for gymnastics, or to learn some kind of handiwork; and those who are regular members of Boys' Brigades and Bands of Hope, would all do well to choose a hobby. They will then have no idle hours; and they will be preserved from many dangers and temptations, which come especially to the idle.

fa-tigue, weariness.
or-di-na-ry, usual, customary.
pur-suit, an occupation.

SUMMARY OF THE LESSON.

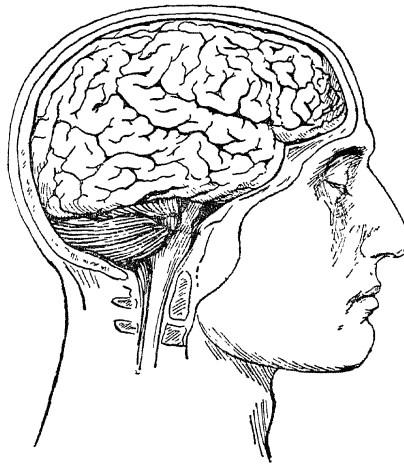
Every part of the body needs rest as well as exercise. Rest is needed so that the body may regain what it has lost while working. The most perfect rest is sleep: during sleep, worn-out parts are repaired and the muscles regain their strength. During the day, change of employment is far more restful than idleness. Recreations, whether out of doors or indoors, are hurtful if they are likely to make us unkind, cruel, or selfish, or if they take up too much time. It is well for everybody to have a hobby to fill up spare time.

Lesson XXXIV.—The Tenant of the House.

(1.) A HOUSE is not built for *itself*, but for somebody to live in, whom we call *the tenant*, because he is in possession of it. You have been reading many lessons about *our wonderful house*, as we have called the human body; but very little has been said about its tenant—the *living soul*. You know that the soul is the tenant for life; and you know that when the soul leaves its earthly tenement or dwelling, the tenement itself soon decays and disappears. You have learned some of the wonders of the body: you have learned how it grows and moves, how it is nourished, warmed, and kept healthy and strong. But the most wonderful dwelling is never as important or wonderful as its tenant: so it is with the mind. You know that it can learn and remember, that it can imagine and reason. You know that it can fear and love; that it can be envious or unselfish; that it can if it will, refuse what is evil and choose what is good. The mind and its powers are far more important than the body, and what it can do. The mind, the living soul, is the master of the body.

(2.) The body has many parts, just as a large house has many rooms; and some parts are more important than others. The owner of a large house rarely visits the cellars, kitchens, and pantries. He usually has his own private rooms upstairs; his

own bed room and bath room, his own dressing room and study. The whole house and its contents belong to him, but he makes much more use of some rooms than of others. So it is with the mind. The whole body belongs to it; but its own special room is upstairs in *the watch tower,* as we



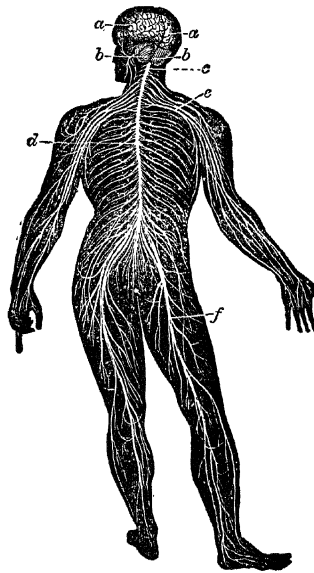
have called *the head.* This is the part where the mind does most of its work. There are *the eyes,* the windows through which it views the outside world. There are *the ears,* through which it receives so much news. If the mind wants to make its wishes known, it can cause *the tongue* to speak,

and *the fingers* to write. When it wants the body to move about, it sends messages to the feet and legs, to the arms and hands. If you could look inside the head you would not see the mind; it is invisible. It is not of the same nature as bones and sinews, flesh and blood. It is *spiritual.* What you would see if the head were opened is what is represented in the diagram. You would see a strange, greyish-white organ filling the skull. This soft, egg-shaped organ with its many folds, is called *the brain*: the brain is the part of the body which the mind uses most.

(3.) Have you ever visited a large factory with its work-shops, engine house, store-rooms, yards and offices? The man who has charge of the place, and of everything which is being done there, is called *the manager.* He has his own quiet, little office, where he can sit and manage the whole factory. Unless he wishes to do so, he need not leave his office during work hours. There are electric bells to summon those to whom he wishes to speak. And there is a telephone which carries his orders to every part of the factory. *The brain* is the office where the manager, the mind, receives and sends messages; and the threads which we call *nerves* are the wires which carry the messages outwards and inwards. The brain and the nerves form what we call *the nervous system.* A *system* means a number of organs all helping to do one piece of work. The wind-pipe and lungs are the breathing system of our organs; the heart, the veins, and arteries are the cir-cu-la-tory system; the brain

and the nerves are the system which helps the mind.

(4.) The brain is protected by the strongly-



THE NERVOUS SYSTEM.

a, *a*, Larger Brain; *b*, *b*, Smaller Brain; *c*, *d*, Spinal Cord; *e*, *f*, Larger Nerves.

arched bones which form the skull. It has two principal parts— the larger brain and the smaller

brain. *The larger brain* is at the top, front, and sides of the head. It is the most important part, because it helps the mind to learn, to understand, and to remember. *The smaller brain* lies under, and at the back of, the larger brain. If this part of the brain is injured we cannot move our body as we wish; so that its work is to help to carry out the mind's wishes about our movements.

(5.) The brain is the mind's office, where it receives and sends out messages; and all messages are sent out and received along the nerves. The nerves are silvery-looking threads, very much thinner than the wires which carry electricity. Each nerve is made up of very fine fibres. Some nerves run from the back of the eye to the brain, and enable the mind to see; others run from the ears, the tongue, the nose, and the skin, enabling us to hear, taste, smell, and feel when anything touches us. Other nerves start from the brain and go to the muscles, telling them when to contract, and so to move the body. Thus the nerves are like the wires, which carry messages from all parts of the factory to and from the manager's office. Do not forget that there are two sets of nerves—the *nerves of feeling*, which carry news to the mind, and the *nerves of motion*, which cause the body to move. There are twelve pairs of nerves which start from the brain. One part of the brain continues down the middle of the back, inside a curious chain of bones called the spinal column. You can see in the diagram both the chain of bones forming *the*

spinal column and *the spinal cord*, as the continuation of the brain is called. The spinal cord gives off thirty-one pairs of nerves. Each spinal nerve is a *double nerve*—that is, one part of it carries messages inwards to the spinal cord and brain,

and the other part carries messages from the brain and spinal cord to some part of the body.

ten-e-ment, a dwelling.

tel-e-phone, an instrument which enables us to speak with a person at a long distance.

cir-cu-la-to-ry, helping to circulate.

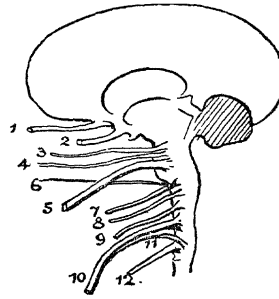
SUMMARY OF THE LESSON.

The body is the dwelling place of the *soul*, or *mind* as we often call it. The brain, contained in the skull, is the mind's organ. The brain is connected with every part of the body by fine, silvery threads called *nerves*. The brain and nerves make what is called the *nervous system*. All the mind learns about things, it learns through the brain and nerves. Some nerves carry messages to the brain other nerves carry the mind's orders to the different parts of the body. There are twelve pairs of nerves going to or from the brain, and thirty-one pairs of nerves which spring from the spinal cord. These nerves are double nerves: they carry messages both to and from the spinal cord.

Lesson XXXV.—The Nervous System and its Enemies.

(1.) THE twelve pairs of brain nerves are very important servants of the mind. One pair goes to the eyes, another to the nose, and others to the ears, tongue, neck, and throat. Some of these nerves carry in knowledge to the mind which it could never get without them. Others carry the mind's orders to these organs, and set them moving just how and when the mind wishes them to move. The spinal nerves go to the limbs, and to other parts of the body not visited by the brain nerves. The spinal cord itself is a big nerve, for by it, all its many nerves are connected with the brain. The spinal cord also learns to relieve the brain of a good deal of work, just as the assistant

manager's office in a factory relieves the head manager's office. When we are learning anything new, for example, *learning to swim*, we have to give our mind to every movement or we should never learn. The mind, by means of the brain, attends closely to anything new. But when we have learned to do it, that is, when we can make the proper movements without thinking about them, the mind does not attend to them. It leaves the movements to be directed by the spinal cord, which thus does some of the brain's work.



(2.) Without the living, active brain and nerves, the rest of the body would be as good as dead: we should be unconscious. We should perceive nothing, feel nothing, and be able to do nothing. Fire might burn us, knives wound us, accidents crush us; but we should know nothing about these things. What an important part of the body the

nervous system is! Yet there is no part so feeble in itself. The brain is a mass of greyish-white pulp; the nerves are only slender, delicate threads made up of tiny cells and fibres. But both brain and nerves are well protected from outside hurt, the brain by the strong bones which form the skull, and the nerves by the parts in which they are embedded. Like every other part of the the organs of the nervous system have work to do; and because they have work, they waste, and require to be nourished by the circulating blood. Whatever helps to make good blood, whether it be good food, fresh air, or wholesome exercise, helps to make good brains and nerves. And whatever makes the body feeble and sick, helps to hurt the nervous system and hinder its proper working.

(3.) These wonderfully delicate and important organs have many enemies. *Over-work* and *loss of rest* are very injurious, especially to the brain and nerves. Because these parts are delicate and have much work to do, they rapidly waste. Hence they want sufficient and regular rest. The brain does not want to be lazy; plenty of work is good for it. But over-work and loss of rest will very soon weaken it. *Worry* and *over-anxiety* excite the brain and nerves, and hinder their rest. *Constant excitement* acts in the same way. Change of employment rests the brain; but no kind of rest is as good for it as sound sleep. People whose work is nearly all brain work want plenty of sleep; and whatever hinders regular, sound sleep,

should be carefully avoided as an enemy of the nervous system.

(4.) The biggest enemy of the brain is *alcohol.* There are reasons why alcohol (the hurtful part of all strong drinks) does more mischief to the brain than to any other part of the body. When alcohol passes into the stomach, it immediately enters the blood, and is rapidly carried to all parts of the body. The brain is very full of blood vessels; it is said that one-fifth of all the blood in the body is in the brain. Hence, if alcohol be taken, a good deal of it gets into the delicate substance of the brain. It does much mischief there in two ways. First of all, it inflames the brain and excites it. You know how soon people, who drink strong drink freely, begin to show excitement by their looks, their words, their tones of voice, and their actions. But while alcohol at first excites the brain and nerves, by causing too much blood to enter them, it soon begins to benumb and deaden them, or *paralyse* them as we say. You have learned that alcohol is called a *narcotic poison;* any substance such as *alcohol, opium,* and *nicotine* (the poison in tobacco), which paralyses the nerves so that they cannot work, is called a *narcotic.* Another mischief alcohol does, is to hurt the very small and delicate cells and fibres of which the brain and nerves are made. These begin to waste away, and the sheaths, or coverings of the brain and nerves, are thickened. This is why the constant and intemperate use of strong drink often ends in diseases of the brain and nerves. And because the nervous

system regulates the work of all the other parts of the body, it is not difficult to see that the whole body must suffer, more or less, with the nervous system.

(5.) *Tobacco* is another enemy of the nervous system, because, as you have just been reminded, the nicotine in tobacco is a dangerous narcotic poison. The pale faces and trembling hands o. boys, who have foolishly formed the habit of smoking cigarettes, are clear proofs of the mischief they are doing to the nervous system. Some people are tempted to take narcotic poisons like opium, laudanum, and morphia, in small quantities, because these substances will remove pain. But all these things, like alcohol and tobacco, have the power of making us fond of them, and even crave for them, if we once begin to take them. The habit of using them may then become so strong that we cannot resist it.

(6.) If you want to keep good health and spirits, *never indulge in bad habits of any kind:* avoid strong drink ; never touch a cigarette or any kind of tobacco ; take plenty of healthy exercise in the fresh air : do not read unwholesome and exciting story books, but fill up your spare time with wholesome reading and a pleasant hobby.

em-bed-ded, laid in.

be-numb, to make numb ; to make without feeling.

o-pi-um, dried juice from the heads of the white poppy.

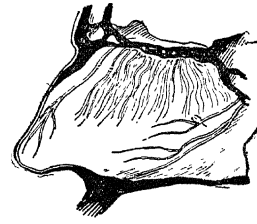
SUMMARY OF THE LESSON.

The mind's most useful servants are the twelve pairs of brain-nerves, for through their aid, it gets its knowledge of the outside world. The spinal-cord is not only a thick nerve trunk which connects its thirty-one pairs of nerves with the brain: it can also act as a part of the brain, and relieve the brain of some of its easier work. The brain and nerves have many enemies ready to hurt them. Over-work, want of proper rest, excitement, and worry, are all hurtful to the body, and especially to the nervous system. But alcohol is its worst enemy. It begins by inflaming and exciting it: then it partly paralyses brain and nerves so that they cannot work properly. It sometimes wastes and changes their substance. Alcohol, tobacco, opium, and all narcotic poisons are hurtful; and they often become the masters of those who use them.

Lesson XXXVI.—The Gateways of Knowledge.

(1.) JOHN BUNYAN was a good man who lived in the time of James II. He earned his living as a tinker; but he also became a noted preacher and a writer of good books. Among his books is one called "*The Holy War*," in which he describes a battle we must all take part in—the fight between our own soul and all its deadly enemies. Bunyan says: "The famous town of Man-soul had five gates, in at which to come, and out at which to go, and these were made likewise answerable to the walls: that is impregnable, and such as never could be opened nor forced but by the will or leave of those within. The names of the gates

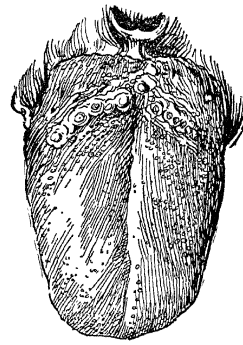
were these: Ear-gate, Eye-gate, Mouth-gate, Nose-gate, and Feel-gate." The ear is, of course, the gate by which all *sounds* reach the mind; *sights* can only get to it through the eye; *scents* through the nose, *tastes* through the tongue, and *touches* through the tips of the fingers and other parts of the outer skin. Try to think what the mind of a child would be who was born without the *five senses*, as we call these gateways. If he could neither see for himself, nor hear what others told



him, nor touch the things around him, nor notice how things taste or smell, his mind could never learn one single thing. Do you see why the senses are called the *gateways of knowledge?* They are the only channels by which the mind can receive knowledge about the world and what is in it.

(2.) Each of the five senses, *taste*, *smell*, *touch*, *hearing*, and *sight*, has its own organ or organs, that is, its own parts of the body. You know that the inside passages of the nose are the organs of smell. A pair of brain nerves go to the nostrils,

one to the right and one to the left nostril. Each of these nerves splits up into branches, which spread out just under the moist surface of the nostril. When we want to smell anything, we place it near the nose and sniff up air. The air brings very minute particles of the substance into the nostrils. These particles touch the nerve of smell, and the



nerve carries the message which tells the mind how the thing smells. Smell is a very delicate sense, and a very useful sense. It helps us to judge whether food is good and fit to be eaten; and it tells us whether hurtful or unpleasant things are mixed with the air we are breathing.

(3.) If you will use a looking-glass and look at your tongue, you will see many little projections making its moist surface quite rough. These pro-

jections are the organs of taste. We can only taste things which will dissolve on the moist surface of the tongue. Each projection has a nerve to carry to the brain the information which enables the mind to tell how things taste. Like the sense of smell, taste is a very useful sense to the body. But neither of these senses carries to the mind nearly as much knowledge about things, as it gets through touch, hearing, and sight. Neither strong drink nor smoking are good for taste and smell. They rob these delicate senses of their keenness; and, when used to excess, they take away the liking for wholesome and simple foods and drinks. Tobacco smoke dries the moist membranes of the nose and tongue, so that tastes and smells are not so readily distinguished.

(4.) Touch-gate is a very important gate-way, for it carries very much useful knowledge to the mind. Have you ever thought how those who have been born blind, learn the shape and sizes and parts of things just as well as you do, who have the use of eyes? They cannot know what light and colour mean. But with touch alone they can learn most of the other properties of things which you learn through the eye. We might almost say that a blind man learns to see with the tips of his fingers; but of course his fingers can never reveal to him those most beautiful things which we call light and colour. The hand can do more than touch, *it can grasp*. The schoolboy holds his pen, pencil, and ruler with his hands, as well as his cricket-bat and top; the girl's hands

become skilful in using a needle; the gardener holds his spade and rake, the driver the reins to guide his steed, the workman his tools, the artist his brush, the musician his instrument, with the hands. The most wonderful and beautiful things made by men, are not made by machinery, but by the hands of clever workmen and workwomen. Without the delicate sense of touch and the power to grasp, the hands would be of little or no use. But it is the *mind* that tells the hand what to do and how best to do it. The hand is only a servant of the mind: it obeys the mind when it touches, holds and moves things; and it sends to the mind very much useful information about the things it touches and holds.

(5.) What skilful things can be done with the hands! Those who have seen how easily a blind girl can thread a needle; or a watchmaker repair the minute parts of a watch; or a good draughtsman sketch a drawing; or a clever pianist play difficult music, must have wondered at the degree of skill which can be obtained by long and constant practice. Those whose work requires great steadiness, delicacy and care in using the hands, find that it is necessary to be very temperate with strong drink and tobacco, because these things are likely to make the hands unsteady and to deaden the nerves with which the mind directs them. A boy whose fingers are stained with nicotine from cigarettes cannot hold his hand quite still. And no workman can turn out his best work after he has been giving way to strong drink. Total

abstinence from alcohol and from tobacco would save the workman's pocket, help to keep him fit for work, and enable him at all times to turn out his very best handiwork.

im-preg-na-ble, able to resist any attack.

man-u-al, done by the hand.

ab-stin-ence, keeping from the use of anything.

SUMMARY OF THE LESSON.

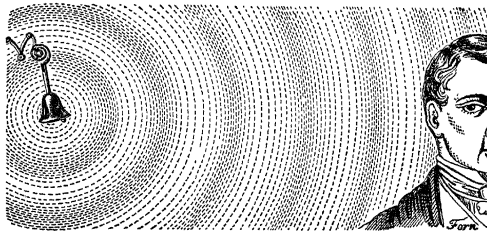
The five senses—sight, hearing, touch, taste and smell—are called the gate-ways of knowledge, because the mind gets its knowledge through them. The eye is the organ of sight, the ear of hearing, the skin of touch, the nose of smell and the tongue of taste. Taste and smell are useful to the body; but touch is far more useful to the mind. Touch is keenest in the tips of the fingers. The fingers can grasp, or hold, as well as touch. The hand, guided by the mind, can be trained to do all kinds of useful and clever work. Alcohol and Tobacco hinder the useful work of the hand, as well as the senses of taste and smell. They deaden the nerves and rob the senses of their keenness.

Lesson XXXVII.—The Chief Gateways of Knowledge.

(1.) A WALLED CITY has usually several gates, but, as a rule, one or two gates are far more used than the others. Of the gateways of knowledge, ear-gate and eye-gate are the most important. "*Earth's many voices*" all speak to the mind through ear-gate. The rustling of leaves, the humming of bees, the songs of birds, the lowing

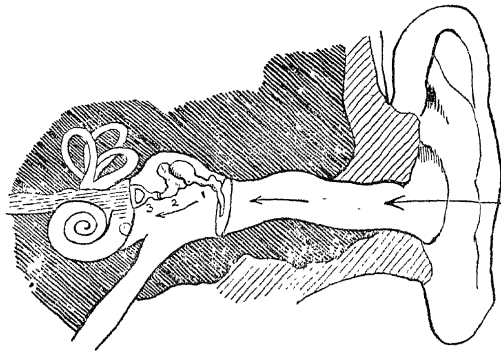
of cattle, the moaning of the wind, the roar of stormy waters, the crash of the thunder, all these and many more of the sounds of nature reach us through the ear. Then think of all we learn from the words of parents, teachers, and friends; think of the pleasure we get through music; and be thankful if you possess this valuable and wonderful sense.

(2.) If it is pleasant to hear Nature's voices, how much pleasanter it is to see Nature's wonders!



We cannot hear the sun rising, nor the moon and stars shining. These wonders can only be *seen*. True, we can learn the shapes and sizes of many things through touch. But who would like to be ignorant of what is meant by the blue sky and the green fields? Who would like to be unable to distinguish the varied hues of flowers, and the loved faces of relations and friends? It is useful and pleasant *to hear* about things; but how much better is the knowledge that we get by *seeing!*

(3.) What is *sound?* It is not a substance but *a movement.* When you throw a stone into the middle of a pond, you see the waves, like rings, moving towards the shore. So when a bell rings, or a voice speaks, it puts the air into circular waves which travel along until they knock against the ear, as you may see in the diagram. The ear has three parts. There is *the outer ear* like a wide-mouthed trumpet; it conveys the waves down



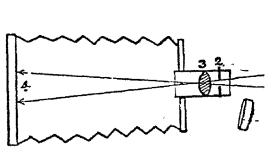
the passage to a small, bony chamber known as *the middle ear.* Stretched across the end of the passage is a tight skin, or *membrane*, called *the drum of the ear.* The air-waves set the air-drum vibrating, just as a drum vibrates when struck with the drum-stick. Neither the outer ear nor the middle ear can hear. The outer ear receives the sound waves. The middle ear is crossed by

a curious little bridge of three very small bones, one of which rests against the ear-drum. When the drum vibrates, the bridge of bones also vibrates, and thus carries the waves to *the inner ear*, which consists of curious, winding passages in the hard bone of the skull. Within these passages, there are the ends of the nerve of hearing. The passages are full of water; and as the chain of small bones vibrates, its vibrations throw the water into tiny waves. The air-waves outside the ear cause water-waves in the inner ear: these waves, striking against the nerves, cause us to hear.

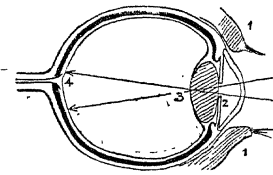
(4.) The ear is a wonderful organ: as you know, its more important parts are hidden away for safety within the bones of the skull. Yet we can easily hurt the ear, although it seems so well protected. A blow, or box on the ears, may rupture the drum; and the bad habit of pushing anything hard into the ear, such as a hair-pin, with the idea of cleaning it, may also do serious harm. Those who suffer from ear-ache may safely put a bit of cotton-wool within the ear on windy or damp days, provided it is not pushed too far. Of course the ear must be carefully washed daily, and dried with a soft towel.

(5.) Wonderful as the sense of hearing is, the sense of sight is far more wonderful. The other senses can only teach us about things that are near; the sense of sight reveals to us the beauties of the sky and the wonders of the sun, moon, and stars. *How do we see?* You have learned that

the ear is an organ contrived to receive and convey to the nerve of hearing, the wave movements caused by the sounding object. The eye is also contrived to receive wave-movements, or *vibrations*—for light is not a substance but a movement. Just as sound is caused by wave-movements in the air, so light is believed to be wave-movements in a very subtle substance called *ether*, which is supposed to fill all space. The eye is the organ which receives these waves, and conveys them to the nerve of sight at the back of the eye.



CAMERA.



SECTION OF EYE.

(6.) If you want to understand the working of the eye, you should get somebody to show and explain to you *a photographer's camera*. You will see that it is a dark box, with its inside painted a dull black. At the back of the camera is a piece of ground glass; in the front is a movable lens. You all know what a burning glass is, and how it collects the heat and light of the sun, and brings them to a point, or *focus*. The lens of the camera receives the light which is reflected from

the objects in front of it, and brings them to a focus on the glass screen at the back; there you will see a beautiful picture of the objects in all their natural colours. On a very bright sunny day the photographer often wants to shut out some of the excess of light. For this purpose he uses what he calls *a stop*, a piece of brass with a small round hole in it, which he slips in front of the lens. He uses a stop with a smaller or larger hole, or he uses no stop at all, according to the amount of light.

(7.) *The eye is a camera*, black inside; it has *a lens, a cap* to shut out light altogether, *a stop* to regulate the amount of light admitted, and *a back* on which the picture can fall. *The eye-lids* form the cap which closes the eye. If you look at your eye in a looking-glass you will see a beautifully coloured ring called *the iris*, and the round black spot which we call *the pupil*. The iris is the self-acting stop which regulates the admission of light through the pupil. On a bright day, the iris expands and makes the pupil smaller, so that it admits less light. As it gets darker, the iris contracts and leaves a larger opening. The *lens of the eye* is just behind the iris. The eye is not hollow like the camera. The part of the eye in front of the lens is filled with water; the part behind the lens is filled with a transparent, jelly-like substance. At the back of the eye, the *optic-nerve*, or nerve of sight, is spread out like a curtain, ready to receive the light waves. It is called *the retina*. Whenever we look at anything,

the picture of it is formed on the retina by the light-waves, and the mind is enabled *to see.*

vib-rate, to shake, to move to and fro.
sub-tle, extremely thin.
rup-ture, a breaking or bursting.

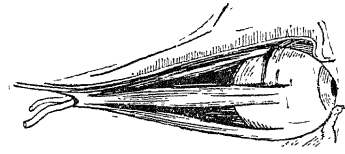
SUMMARY OF THE LESSON.

Hearing and sight are the most important senses, because we get most of our knowledge through them. Whenever anything gives forth a sound it *vibrates*, and its vibrations pass on to the air around. When these air-waves, or vibrations, reach the ear, they make the ear-drum vibrate, and its vibrations are carried across the middle ear by a bridge of small bones to the liquid in the inner ear. The vibrating liquid knocks against the nerves of hearing and we are able to hear. Seeing is the result of the vibrations which we call light. The waves of light pass through the pupil and the lens of the eye, and are brought to a focus on the retina, a curtain of nerves at the back of the eye.

Lesson XXXVIII.—Enemies in the Gates.

(1.) A PHOTOGRAPHER'S CAMERA is a beautiful instrument, and many clever men have helped to bring it to a state of perfection. But it will never become as perfect as the eye, because the eye—*a living instrument*—can learn to do so much for itself. The photographer must insert the proper stops, to regulate the amount of light to be admitted into the camera. The iris of the eye is made up of very delicate, muscular fibres, which contract and

expand according to the amount of light falling upon them: this is why the eye can adapt itself to the light. The photographer must shift the lens of the camera to suit the distance of the object. The lens in the eye has a muscle attached to it, which can slightly alter the shape of the lens and enable us to see objects, both far and near. The camera has to be turned about to bring it into the required position. *The eye can move itself.* Each eye has three pairs of muscles, so that we can turn it either upwards, downwards, sideways, or make it revolve.



FOUR OF THE SIX MUSCLES WHICH MOVE THE EYE.

(2.) The eyes are such valuable members that we cannot take too much care of them. The more intricate and delicate a machine is, the more easily it can be damaged and even spoiled. It is very hurtful to the eyes, to read or work with insufficient light; and it is equally hurtful, to read or work with the glare of bright daylight full in the face. Permanent injury to the retina may follow either of these foolish practices. Few things are more likely to hurt the eyes than to go on with fine needlework, reading, or other work trying to the

eyes, after they are thoroughly tired. Aching and smarting in the eyes are sure signs that they need rest. It is always well to sit or stand at work so that the light does not fall directly in the eyes, but sideways upon the work. Many children in school both read and write with their eyes too near the book. This puts a severe strain on the eyes and may lead to *short sight.* If dust, or any small object, gets in the eye, do not rub the eye. Draw the upper eye-lid downwards two or three times: this will generally give relief.

(3.) We have learned something about smell taste, touch, hearing, and sight. To these five senses we might add a sixth sense, called *the muscular sense.* When you use the muscles of your hand to grasp anything, you *can feel* you are grasping, and you *are conscious* how hard you are grasping. This feeling is the muscular feeling or sense. It is very important because of the help it gives the other senses. The eye, for example, would be of little use if it had no muscles to move it. Even the nose would be of little service, if its muscles did not enable us to sniff air into its passages. The muscular sense also enables us just to use as much force as is required to perform any action. It is a sense which admits of much training. In learning to write, draw, swim, or play any musical instrument, the muscular sense improves rapidly, until we can do these things almost without effort

(4.) We have called the senses the gateways of the mind, because the mind receives its supplies

of knowledge through them. When the enemy besieging a city gets hold of the gates, the city and all within it are in his power. No supplies from the outside can reach the inhabitants; and the enemy can make his way into the city. No one in the city, if he wished to keep out the enemy, would be so foolish or so treacherous as to give him possession of the gates. Yet millions of people, day by day, willingly put dangerous enemies in possession of the gateways of the mind, and thus do great hurt not only to the bodily house but also to the soul, its tenant. In Lesson XXXV. you learned that there is a class of drugs called *narcotics*, such as opium, laudanum, chloroform, and morphia, which will, in small doses, relieve pain. Such drugs should never be used except by the doctor; he knows the great harm they may do, and will not continue to give them when they ought no longer to be taken. Many people take these dangerous things without the doctor's orders. Sometimes, by accident, they take an over-dose and kill themselves. Another great danger of narcotics is that *they all tend to make slaves of those who use them.* The man who smokes opium or uses morphia to relieve pain and give him a sleep, soon begins to find he cannot do without the drug. *He becomes its slave;* and he finds it is a hard, cruel taskmaster. Even in small doses it deadens and stupefies the nerves and brain: hence the senses cannot do their work properly. There is an enemy, a deadly enemy, in possession of the gates; and not only bodily health,

but the mind, suffers in many ways, as you will learn in a later lesson.

(5.) But alcohol is a more dangerous enemy to the senses than these drugs. An enemy, that comes to us professing to be a friend, is the worst kind of enemy. Many look upon strong drink as a good thing: and they think it a friendly act to offer it to others. It may be well to remind you once more that alcohol is *a poison;* that 3 ozs. or 4 ozs. of pure alcohol is sufficient to kill a good-sized dog; and that men have died immediately after drinking a large draught of brandy or whiskey. It is *a narcotic poison.* At first it seems to excite the nerves, but very quickly it stupefies them. When the nerves which go to the muscles are stupefied, the muscles lose their power, and our control over them is lost. This is the reason why the drunken man cannot walk straight, and is often unable to walk at all. His sense of hearing also becomes dull, and he can no longer see distinctly. Even small doses dull the keenness of sight and hearing, and deaden the muscular sense. Men whose work requires very great skill of eye and hand, find they can only do their best work when they abstain from intoxicating drinks. No surgeon would think of touching these drinks, when he has some operation to perform which needs all his skill and steadiness of hand, and all his keenness of vision.

(6.) Tobacco also paralyses the nerves, and thus dulls the senses. Boys who wish to grow up with strong, firm limbs both for work and play,

with bright, keen eyes, with clear brains and steady hands, will be wise never to smoke either cigarette cigar, or pipe of tobacco.

in-tri-cate, having many parts

per-ma-nent, lasting.

par-al-yse, to take away power of acting.

SUMMARY OF THE LESSON.

Besides the senses of taste, smell, touch, sight, and hearing, there is another very useful sense called the muscular sense. It is the feeling we have, when we use the muscles in lifting, grasping, and other bodily acts. It tells us how much force we are using, and helps us to use our strength in the best way. It also helps every one of the other senses. All narcotics—such as opium, laudanum, and morphia—deaden and paralyse the senses, so that they cannot work well. The alcohol in strong drink robs the drunkard of his senses while he is intoxicated. Very small quantities of strong drink take away some of the keenness of the eye and ear, and some of the delicacy of the muscular sense. Tobacco, like alcohol, is a narcotic poison, and prevents the senses doing their best work. Both alcoho and tobacco are enemies in the gates.

Lesson XXXIX.—Bodily Strength and Strong Drink.

(1.) NOT a few people seem to think that intoxicating drinks are called *strong drinks* because, taken in moderation, they give bodily strength. In this lesson we will try to answer the question whether a man who takes strong drink, can work harder and longer than one who abstains. In another

lesson we will try to answer the question whether drink helps him to do *better work* than he would do without it.

(2.) There is no doubt that a little strong drink often seems to give fresh strength to a weary man. When a tired horse is touched with a whip or spur, it, for a time, pulls stronger or runs faster. Yet it is very plain that neither the whip nor the spur can have put any strength into its wearied limbs. All they have done is to arouse the poor beast to make a fresh effort. The renewed effort only causes it to use up more rapidly the little strength it has left. Just as the pain of whip or spur stimulates a horse to work harder, so alcohol, taken in moderate quantities, acts for a short time as *a stimulus*, or *spur*, to the body. It seems for a time to make the cold man warmer, the dull gloomy man more cheerful, and the weary man stronger. But as it is with the spur, so it is with alcohol; its first effects soon pass away, leaving the man colder, gloomier, and more weary than before.

(3.) As you have already learned, bodily force resides in the muscles; and how much force a muscle possesses depends upon its power of contracting. Now, careful experiments have proved that *strong drink lessens rather than increases this power*. A man cannot grasp an object as strongly or as steadily, nor can he lift as heavy a weight, after taking alcohol, as he can before taking it. You ought to be quite able to understand why this must be so. When we wish to lift or grasp

anything, the mind sends its wish to the muscle by means of an out-going *nerve.* But, as you know, alcohol, like all narcotic poisons, deadens or partly paralyses the nerves. Hence, if the nerves which regulate the work of the muscles are weakened, it is not surprising that the muscular contractions also are weakened. The muscles can therefore never do their best work when under the influence of strong drink. Those who want strong, steady, healthy muscles, should avoid both alcohol and tobacco, for both are narcotics.

(4.) It is well known that workmen, who are not total abstainers from strong drink, find it necessary to abstain when their work is exhausting or long-continued. Hence men who work at the furnaces where glass is made or iron ore smelted, miners, forgemen, workers in the harvest fields, and others whose occupations are very laborious, find they can do their heavy tasks easier without intoxicants than with them. Experiments have sometimes been made during harvest to test whether alcohol is a help or hindrance to the harvesters. It has always turned out, that those who are supplied during work hours with a really useful and refreshing drink, like oatmeal and water, can work longer, and with less exhaustion, than those who have been supplied with beer or cider. Neither is it hard to understand the reason. Oatmeal is a valuable flesh-forming and force-supplying food. Alcohol, as you learned in Lesson XIV., has no true value as a food, and hinders the easy digestion of foods.

(5.) There are occasions when it is necessary, that a very heavy and important piece of labour should be well done, in the shortest possible period of time. If strong drink can impart, or in any way assist, bodily strength, is it not plain that it should be used on such occasions of severe toil? The Great Western Railway on two occasions, one in 1872 and the other in 1892, required extensive

alterations to be made on their line. In 1872, four hundred miles of single line had to be taken up and re-laid. The task occupied fifteen hundred men, working double time for a fortnight. In 1892, two hundred miles of single rails were re-laid in thirty-one hours by five thousand men, who worked seventeen hours the first day and fourteen on the second. On both occasions *no strong drinks were supplied*, but the men were provided *with as much oatmeal and water as they chose* to drink. Does this not

clearly prove that, in the opinion and experience of great employers of labour, strong drink is a hindrance and not a help to manual work?

(6.) Generals who have had to lead troops by forced marches across deserts and through swamps and trackless forests; explorers amid the ice and snow of the arctic regions; and all who have had occasion to put numbers of men to tasks in which their powers of work and endurance were severely tested, come to the same conclusion. They one and all tell us that it *was only by withholding strong drinks* from their men, that they were able to succeed in their toilsome tasks.

(7.) What do famous athletes, the men who are great cricketers, rowers, swimmers, and walkers, say about alcohol? They all agree that it is wise to make no use of it, either during training or actual contests. Weston, the greatest walker of modern times, who walked five thousand miles in one hundred days, at fifty miles a day, was a total abstainer. Captain Webb, who successfully swam across the Channel, used alcohol on his first attempt and failed; the second time he abstained, and then succeeded. These and many many more facts, all clearly give the same answer to the question with which this lesson begins; they all say "strong drink always hinders and never assists bodily work."

en-dur-ance, power to last out through a hard task.
ex-haust-ing, weakening.
ex-pe-ri-ence, one's own personal knowledge.
ath-lete, a person skilled in games requiring bodily activity.

SUMMARY OF THE LESSON.

Alcohol at first acts like a spur; it cannot impart bodily strength, but it can arouse it. The only thing which can impart bodily strength is *food*, and alcohol is not a true food. It partly paralyses the nerves which cause the muscles to do their work; hence muscular power is lessened and never increased by strong drink. Experiments prove this to be true. Workmen who follow the most laborious occupations, find they can work longer and with less fatigue, if they abstain. The experience of those who have had to direct men engaged in tasks requiring great strength and endurance, and the universal testimony of athletes, teach us that alcohol is a hindrance to bodily work.

Lesson XL.—The Mind and its Work.

(1.) WHAT is it that makes man supreme amongst God's creatures on earth? It is not his size nor his strength: many of the beasts are larger and much stronger than he. Neither is it his bodily powers that place him highest. In speed, the horse and the deer easily surpass him; the bear is a much better climber; the kangaroo a longer jumper; the frog a better swimmer, and the mole a better miner. His sight is neither so keen nor so long as that of many birds; his scent and hearing will not compare with those of many animals. It is his mind, his spiritual nature, which raises him above the animal creation and makes him what the Psalmist calls him, "*a little lower than the angels.*"

(2.) The mind works as well as the body: indeed the mind is often at work when the body is resting, for it is never altogether at rest during waking hours. It works in many ways. It looks out through its gateways, *the senses*, to learn what is going on: then we say it is *observing*. It stores up the knowledge it gains, so that it can use it when it is wanted: then we say it is *remembering*. It can picture for itself things which the eyes have never seen; it can fancy it hears sounds which have never entered the ears: then we say the mind is *fancying*, or *imagining*. It is often trying to think things out so as to understand them: then we say it is *thinking* or *reasoning*. It can find out new ways of doing things: then we say it is *planning*, or *contriving*, or *inventing*. The mind has to learn how to do these different kinds of work, and it can never learn to do them without much practice. As the fingers can only become skilful in using the pen, or in playing a violin, by much painstaking practice, so the mind can only do its work in attending, observing, imagining or reasoning, by steady persevering practice.

(3.) The mind's work, or *mental work* as we call it, is very important. We can do no useful bodily work unless our minds attend to and direct it. But while the bodily work of the ploughman, the mason, and the smith is hard, the mental part of it soon becomes easy. Hence these workers go home tired in body rather than in mind. But it is different with the doctor, the lawyer, and the teacher:

their work is not so much manual work as mental work; they go home, after work is done, *brain weary*, and not weary in their limbs.

(4.) But why does the brain get weary? Whenever the mind is busy, the brain, the mind's organ, is busy too. The harder the mind works, the faster the delicate substance of the brain wastes away, and the more the brain needs that time of resting which we call *sleep*. In Lesson XXXV. you were taught that strong drink is the brain's greatest enemy, and works very much mischief there. When we see the sad sight of a drunken man, he is stupid in mind, noisy and violent in conduct, unable to speak distinctly, and unable to control his limbs, because much of the alcohol he has drunk has found its way to the brain, the mind's organ, so that it cannot do its work properly. Alcohol hinders the brain's work (and therefore hinders mental work), even when it is taken in small quantities, especially if taken regularly. The senses are never as keen, nor the memory and reasoning as good as they ought to be, when the brain is muddled with drink. This is the reason why the quality of manual work suffers, if the workman is under the influence of strong drink. His hand is not only less steady, it is *less sure*, because the brain and nerves, which direct the moving muscles of arm and hand, are more or less stupefied.

(5.) When you have looked with shame and sorrow on a drunken person, you have not seen the worst that strong drink can do to the mind and its powers. Long and repeated fits of drunkenness

frequently end in an attack of a dangerous disease called *de-li-ri-um tre-mens*, a temporary form of madness, in which the diseased brain causes the mind to be the victim of terrible delusions. One poor victim of this awful malady was seen jumping from chair to chair, tormented with fear, because he thought thousands of snakes were pursuing him. It must also be remembered that the constant and intemperate use of alcoholic drinks, especially spirits, often leads to permanent insanity. It has been calculated, that probably not less than 40 per cent. of all who, unhappily, have to be put into asylums for the insane, lose their reason through strong drink; and physicians who deal with brain diseases, ascribe the larger share of them to the same cause.

(6.) The experience of those who have much mental work to do fully proves that they can do it best without strong drink. Just as non-abstaining athletes usually abstain when training for contests of bodily strength and skill, so non-abstaining students generally abstain when they are reading hard for some important examination. Among the great army of brain workers—authors, doctors, lawyers, artists, clergymen and accountants—there are tens of thousands who habitually abstain from all intoxicating drinks. As a rule, they find they can work harder and longer without these dangerous things, and that they are not so likely to break down in health. All who wish to preserve at their very best, the wonderful mental powers God has given them, should avoid useless, hurtful alcohol, the chief enemy of

brain and mind; and if they abstain from the use of all narcotics, even from tobacco, they will do well. Rest, when the mind is weary; sufficient sleep at regular hours; nourishing food and harmless beverages; plenty of out-of-door exercises; and a cheerful, contented disposition—these are the things which help to keep both mind and body healthy and vigorous.

de-lu-sion, a false idea which has taken possession of the mind.

in-san-i-ty, unsoundness of mind; madness.

ac-count-ant, one whose business is to keep money accounts.

ha-bit-u-al-ly, customarily, regularly.

SUMMARY OF THE LESSON.

The mind works longer and more constantly than the body. It has not only its own proper work of observing, remembering, imagining, judging and reasoning; it has also to keep watch over and direct the work of the body. The mind's organ is the delicate organ we call the brain: therefore whatever hurts the brain is a hindrance to mental work Nothing damages the brain so much as alcohol. We can see its evil effects, both on brain and mind, in its power to *intoxicate*. When taken to great excess, it sometimes produces the temporary madness known as *delirium tremens;* and it causes much of the insanity, which fills our madhouses and asylums with the *insane*. Experience teaches all brain-workers that they can work harder, longer, and more comfortably, and that they can do better work, without alcohol than with it.

Lesson XLI.—The Mind's Master Power and its Enemies.

(1.) THE mind has other powers besides the power to observe, to remember, to imagine, to judge, and to reason. It possesses what we call *feelings;* it can feel *sorrow*, *pity*, *impatience*, *anger*, *love*, *hatred*, *surprise*, and many others. Some of these feelings are good, and we ought to encourage them: others like *envy*, *malice*, *hatred*, *impatience*, we ought never to give way to.

(2.) There is another mental power which we may well call *the master power*, for it controls and directs all the others. It is *the will*—that is, our power to choose for ourselves. We can choose to be idle or diligent, unselfish or kindly, because God has given us this supreme power. Without it we should neither be able to control our thoughts, our words, nor our actions. Self-control is one of the noblest of our powers; it is that which makes us masters of ourselves. When we were babies we possessed little or no self-control. We could not keep our limbs still; we could not control our desires or our tempers. But little by little we learned, first to control our limbs, then to control our organs of speech. When we first went to school we found it hard to control our attention; our thoughts seemed always to be wandering. But day by day, as will power grew, we learned to be more attentive.

(3.) God has given us wills, not because we ought always to have our own way, but so that

we may choose what is right and refuse what is wrong. The will has many hard lessons to learn. It is not always easy to make up our minds to do what is right; it is often hard to control idle thoughts, angry words, selfish desires. But every victory which self control wins, makes it easier next time to listen to the voice of conscience and duty. Solomon was thinking of the man who had well learned the lesson of self control, when he wrote, "*He that is slow to anger is better than the mighty; and he that ruleth his spirit than he that taketh a city.*" The most important victories we can win, are the victories over our own evil tempers and desires.

(4.) This is just what the word *temperance* means. A man is a temperate man when he possesses sufficient self control to say "*no*" to every evil desire, however tempting it may be; and to say "*yes*" when duty calls him, even if it be to an unpleasant task. A man is temperate in eating and drinking, not only when he takes just as much as the stomach needs, but also when he can say "*no*" to that which reason tells him he had better not eat or drink. He is temperate in speech, when he says just what ought to be said and no more. All his habits will be temperate if he has well learned how to "rule his spirit," and does not let his desires rule him. True manliness is, to be *master of one's self.*

(5.) *Self-indulgence* is the great enemy of self-control. Every time we indulge any selfish feeling or angry passion, every time we "*give way*" to

what we ought to resist, we are weakening self-control. Some people lose their powers of self-control. The passionate man cannot control his temper; the glutton cannot control his appetite for food; the drunkard cannot resist the attractions of drink. Self-control is neither gained nor lost all at once. If we, time after time, resist what is harmful, our power of resistance increases. If we give way to evil practices, it becomes harder and harder to resist them: they become our masters. Day by day our habits are growing stronger: one day they will become so strong that they will be well-nigh irresistible. This is why all bad habits, such as laziness, untruthfulness, intemperance, are so hard to cure.

(6.) I hope you are beginning to see the importance of learning self-control. One reason why all wise and thoughtful people are sorry to see boys smoking cigarettes, or any form of tobacco, is that these things are altogether hurtful to the stomach, the heart and the brain. But another reason is, that smoking is a form of useless, mischievous self-indulgence, and will, in all probability, lead boys to other evil habits. It too often leads them to be uncleanly, and to deceive their parents; and, in the case of youths, it leads them into drinking habits, and to be careless of the comfort of others who do not like tobacco smoke.

(7.) Perhaps there is no habit which so quickly and completely robs a man of self control, as the habit of drinking intoxicating drinks, especially when a liking for them is formed. The drink pro-

duces a craving for itself, which sometimes becomes irresistible. When the wretched victim once becomes the slave of drink, neither shame nor fear, neither love of wife nor of child, can induce him to give it up. He has lost self control. It is well you should understand that, even when alcoholic liquors are taken in moderate quantities, they very often weaken self-control. It is not difficult to explain the reason for this fact. You learned in Lesson XXXV. that a large share of the alcohol which enters the stomach, at once finds its way to the brain. The part of the brain which it first influences is the *greater brain. But this is the part in which the will has its seat.* What wonder, then, that will power is lessened, even with the first glass, and that each successive glass tends further to lessen self control. How is it that they who tempt people to do foolish or wicked deeds, generally begin by inducing them to drink strong drink? Because they know that the drink stupefies the intelligence and weakens the will power, so that their victims are ready to do what they would have refused to do, had they been perfectly sober. Why are so many terrible crimes done when men are under the influence of strong drink? Because the alcohol inflames their evil passions and sends to sleep the power of self control. It is wise to remember, that the first glass may begin to weaken the will power; and that all those who never taste strong drink, are perfectly safe from the dangers which so often arise from its use.

con-trols, rules, has command over.

ir-re-sist-i-ble, cannot be resisted or controlled.

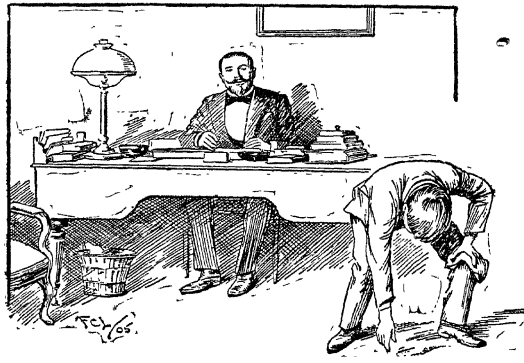
SUMMARY OF THE LESSON.

The will is the mind's master power; by it we can control our bodily movements, our words, our thoughts, and our deeds. Self control only becomes strong by degrees; at first it is weak—it becomes strong by practice. Habits of self indulgence weaken self control. *Temperance* means *self control.* No man is really a temperate man unless he is master of himself, his thoughts, his desires, his words, and his acts. One reason why smoking is harmful to boys is, that it is a useless form of self indulgence which tends to undermine self control. Alcohol is the greatest enemy of self control, because it influences that part of the brain where the will has its seat.

Lesson XLII.—Habits and Character.

(1.) ONCE a poor country lad left his home in a distant French village to seek employment in Paris. He had a letter of introduction to a banker, but, on presenting it, he was told there was no vacant post in the bank. As he turned away disappointed, he noticed a pin lying on the floor. Picking it up, he placed it near the banker with a polite word of explanation and departed. Before he had gone far the banker recalled him, and after asking him a few questions, promised to find him a place among his junior clerks. The banker had noticed that the country boy possessed at least three excellent habits, none too common amongst boys either in town or country: He was *polite* both in his manners and his speech; he was

observant, noticing a pin even when his mind was full of disappointment; and he was *thrifty*—he recognized that a pin has some value and was worth picking up. The possession of these three good habits—the habit of politeness, of being observant, and of thrift—made the fortunes of the lad: one day he himself became a banker.



(2.) But how did the boy get these habits? He was not born with them; for we do not bring habits with us into the world. Each one of us has to make his own habits. Parents and teachers may guide us and advise us; they may encourage us to form good habits and correct us when they see we are forming bad ones. Nevertheless, it is true, that it is our own doings which make our habits. Why have you formed the habit of

being attentive in lesson time? You were not always attentive. But day after day you have had to try to attend, so that now you can do it easily. What is a habit? It is the disposition to do a thing. The pupil who, month after month, has reached school in time, has formed a liking or disposition for punctuality. Habits are slowly formed; but when once formed they become part of ourselves. This is the reason it is so hard to change a habit. The boy who holds his pen badly in his first writing lessons, will soon form the habit of holding it badly, and will find out by and by how difficult it is to correct a bad habit. We cannot change our habits as we do our clothes. They are as much a part of ourselves as our limbs are.

(3.) The habits which we form when we are young are the most lasting. If we see a slovenly man or woman, we may be pretty sure he or she formed the bad habit of slovenliness as a child. The youth in our story had formed the habits which so pleased the Parisian banker, long before he started for Paris. There is an old proverb which says "*The boy is father to the man.*" What it means is just this, that the habits the boy is forming, will make him what he is when he comes to manhood. Parents, teachers, and friends anxiously watch over you in your early years, because they know you are forming habits which will cling to you in after years; they know that character is built up of habits as surely as a house is built up of bricks or stones.

(4.) But what is *character?* A boy when leaving school for his first situation sometimes asks his master to give him a *character.* What he wants is a letter stating that he is punctual, industrious, truthful, steady, intelligent, trustworthy. If his schoolmaster can give a favourable report on these good qualities, the boy leaves with *a good character.* But suppose he is unpunctual, lazy, selfish, untruthful, not worthy of trust! Who will care to employ one having so bad a character? The word *character* really means *a mark, cut into, or stamped on something.* This is why letters, stamped on paper or cut into wood or stone, are sometimes called *characters.* A carver in stone or wood can shape his materials, by means of his cutting tools, into either beautiful or hideous forms, just as he pleases. And so it is in our power to shape our lives into beautiful and useful lives, or into useless bad lives. Day by day we are forming habits, good or bad; it is the habits which make up the character; and it is our characters, and not our wealth or abilities, which determine the quality of our lives.

(5.) When a block of wood or stone is carved, it cannot choose the shape it will take. The sculptor may carve it into the statue of a king or great man: or he may carve it into an unimportant pinnacle, and place it where nobody will observe it. *But our characters depend chiefly on the habits we are forming while we are young; and whether these habits are good or bad, depends much on ourselves, because God has given us the power to choose.*

Many choose to listen to the advice of bad companions rather than to their parents and teachers. Many seem never to be able to say '*no*' when asked to do wrong: they are afraid of being laughed at, or despised as cowards, if they refuse. Many have learned to smoke and drink, not that they wished to do these things, but because they had not courage enough to say '*no*,' when invited to copy the example of their companions. The characters of many boys and girls seem to change for the worse, about the time when they leave school and go out into the world to earn a living. They begin to fall away from regular attendance at the Sunday School and the Band of Hope. The only books they buy and read are worthless periodicals which teach nothing that is good. Many a boy's character begins to change when he first learns to smoke a cigarette. He does it *secretly*, so that parents or employers may not know. At first he did not like it; but soon it becomes a *habit*, selfish, expensive, injurious to his growth and strength; and the smoking habit often leads on to the drinking habit.

(6.) Of all evil and dangerous habits which spoil the characters and blast the lives of many, *the drinking habit* seems to be the worst. In Lesson XLI. you learned how it *enfeebles the will*. But see what an enfeebled will means. It means that a person has not the strength to overcome any temptation that besets him. It means that he will be weak to do what is right; weak to resist evil desires and evil thoughts. *This habit blunts every*

pure, gentle, and kindly feeling, so that drunken mothers neglect their own babes, and drunken fathers waste on drink, what should be spent at home on wife and children. *It lulls the conscience to sleep*, and kills all sense of duty and self-respect. Surely one of the wisest habits we can form when young, is the habit of total abstinence from all such dangerous drinks!

Pa-ri-si-an, belonging to Paris.

pe-ri-od-i-cal, a magazine coming out at regular periods of time.

SUMMARY OF THE LESSON.

Habits are not born with us; it is our doings which make our habits. A habit is formed when we do the same thing over and over again. When a habit is once formed it becomes our master, and it is very difficult indeed to alter it. Day by day we are forming habits good or bad. Our habits build up what is called our *character*, just as the bricks or stones build up a house. Bad habits are formed sometimes through liking our own way; sometimes by copying the bad examples of others. Smoking is a bad habit, not only because of the bodily hurt it does, but because it harms the character in many ways. There is no habit which is likely to cause more hurt to the bodies and souls of men, than the useless, dangerous habit of drinking intoxicating drinks.

Lesson XLIII.—Queen Health and her Laws.

(1.) If you look on a map at the southern coast of Europe, you will easily find a small country named Greece, with groups of small islands around it. Its beautiful hills and valleys, and its many deep bays, lie under a sunny sky nearly always blue; and the sea is as blue as the sky. For many months in the year the climate is warm and delightful. The soil is fertile: oranges and olives, figs and grapes, grow abundantly. Greece is not now one of the leading countries in Europe; but two thousand years ago, its people were famed for their knowledge and wisdom, and for their architecture, sculpture and poetry. They not only cared much about training their minds; they took constant and special pains to make their bodies active, strong and beautiful. For this purpose they established great athletic contests, in which only young men who had been highly trained were allowed to compete. It was esteemed so great an honour to be successful in these games, that the victors were content with garlands of pine leaves or ivy. But with all their wisdom and learning they were worshippers of idols until St. Paul visited Athens (the capital then as now), and taught them about the one God and Father of all. They thought there were many gods, and believed that Zeus or Jupiter was the father of gods and men. They loved the bright sun, and worshipped a sun god: they admired beau-

tiful men and women, and worshipped a goddess of beauty. They had a goddess of *health, Hygeia,* whom they worshipped in her temples. In the carved figures of this goddess, some of which still remain, she is represented as a beautiful maiden, tall and strong, feeding a serpent from a saucer. You know what folly it was for the Greeks to make and worship a goddess of health; but it shows us what great importance they placed on having active, healthy, comely bodies, fit houses for the souls within.

(2.) You certainly will not think of health as a goddess to be worshipped. Yet you will be wise if you try to think of her as a Queen, whose laws must be learned and obeyed. You may think of her as always young and beautiful; as a Queen who does all she can for her people's good; as a ruler who makes no laws, except what will bring happiness to her people. You may think of her as a generous Queen, who has many good gifts to bestow, and who bestows them on all who deserve them. Happiness and comfort of body and mind, depend much upon her. She gives the beauty of healthy, ruddy cheeks, and bright eyes. She gives strong limbs, ready for work or play. She makes us feel fresh, and full of vigour. She does much to make our lives pleasant to live.

(3.) But she is a very strict ruler: nobody can trifle with or disobey her laws, without, sooner or later, smarting for it. If the least of her laws is neglected we must suffer. She never relents: as long as we disobey, suffering continues. Yet she is

neither unkind nor unmerciful. It is because she knows her subjects' welfare depends upon their obeying her laws, that she can not, and will not, overlook any disobedience. Her kingdom is world-wide. In all countries she has both good and bad subjects. The good subjects do their best to obey her: then, unless serious accidents overtake them, they enjoy health, strength, and long life. Some, perhaps, are ignorant of her laws; some carelessly neglect them; not a few, wilfully disobey them: but all must suffer—whether they be ignorant, careless, or wilfully disobedient—if they disobey.

(4.) What would Queen Health (if there were such a person) wish to say to the boys and girls who read this book? I think she would speak much as follows: "I love to see you boys and girls learning to keep my laws, because I know you will then grow up to be comely, strong, and useful men and women. At any rate, *you* will not be able to make the excuse of ignorance if you disobey me, and thus lose the good gifts I bestow only on those who obey. I need not say much to you, for in every one of the lessons in this book, you have been learning about your bodies, and how to keep them healthy and strong. But I will try to sum up what you must do to please me, in a few simple rules, such as you can easily remember."

(5.) "**Avoid over Indulgence.**" Let "**Enough and no more**" be your rule at all times. It is a good rule in respect to *food and drink*. Some, alas! do not get enough to eat: and they cannot be strong. Some selfishly eat too much: they overload the

stomach; and this always causes uneasiness, and sometimes much suffering. Greediness causes young people to eat too fast as well as too much; and to swallow food before it is well masticated. This, too, is hurtful. The rule "*enough and no more*" also refers to *bodily exercise*, and also to *rest*. Young people who are well, and yet dislike either useful work or healthy play, are *lazy*. Both laziness and over-exercise hurt the body; and the worst kind of laziness is spending too many hours in bed.

(6.) "**Fresh air at all times**" is another of my laws. Of course, you can get it out of doors. But breathing goes on in doors as well as out of doors; and all the air breathed ought to be fresh and pure. During the quiet hours of sleep, as well as in the busy waking hours, pure air is needed. Remember all you have been taught about *ventilation*, and, as far as you can help, see your homes are well ventilated.

(7.) "**Cleanliness in all things.**" You have learned that the body cannot be healthy unless the whole body is kept clean. Your clothing, too, especially your under-clothing, needs frequent change. Cleanliness in the home is very important; so are clean bedding, frequently scrubbed floors, the removal of all rubbish and waste day by day, especially that which decays and smells. *You girls* can do much to help to keep clean homes. Good drains, well-swept yards, dust-bins often emptied—all these things are important, for I require "*Cleanliness in all things.*"

(8.) **"Regularity in all things."** One of my laws, often broken, is the law of regularity. Regular hours for meals, and no eating between meals; regular hours for going to rest and rising; regular days for changing your under-clothing; *regular times for attending to all the needs of the body;* all these rules will help to keep you in good health. You will find them all easy, when they once become *regular habits.*

(9.) **"Light, especially the sun's direct light, is necessary for health."** Put a living plant in a dark cellar for a day or two, and see how pale and sickly it becomes. Let much health-giving sunlight into your homes. There is a wise old proverb which says, "*Where light cannot come, the doctor must.*"

(10.) **"Abstain from all hurtful things."** *Tobacco* can do you nothing but harm: the *tobacco smoked* is hurtful to *the body* in many ways, as you have learned. The *smoking habit* hurts *the soul*, for it is a selfish indulgence, and leads to other bad habits. *Strong drinks of every kind can only hurt you.* I need not repeat the many ways in which they do mischief. You have been warned against them as dangerous enemies both to body and soul. Strong drink is my greatest enemy. Besides this, it causes very much of the poverty which fills our workhouses, and very much of the crime that fills our prisons. It sometimes brings men to the gallows; and it produces very much of the insanity that fills our madhouses. "*Never begin to drink strong drink*" is the best advice I can give all boys and girls about strong drink.

(11.) Queen Health is, of course, only an imaginary person; but her advice is none the less wise and wholesome. You will not have read this book in vain, if it has helped you to understand, and disposed you to obey her laws. It is well also to remember that the laws of health are a part of God's laws. He who made our bodies made also the rules by which they must be governed: and He who gave us life, expects us to rule our lives according to His word. All experience proves that only godly, righteous and sober lives can be truly healthy, happy and useful lives.

arch-i-tec-ture, the art of building.

sculp-ture, the art of carving in stone and wood.

im-ag-in-a-ry, not real, fanciful.

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